



제26회 대한화학회 유기화학분과회 하계 워크숍

The 26th Summer Workshop of the Organic
Chemistry Division, Korean Chemical Society

2026년 7월 6일 (월) - 8일 (수)
부산항국제전시컨벤션센터



KCS

대한화학회 유기화학분과회
Korean Chemical Society Organic Chemistry Division

2026년 제26회 대한화학회
유기화학분과회 하계 워크숍 프로그램

인사말



유기화학분과회 회원 여러분께,

제26회 유기화학분과회 하계워크숍에 참석해 주신 여러분을 진심으로 환영합니다.

올해 워크숍은 부산항국제전시컨벤션센터(BPEX)에서 7월 6일부터 7월 8일까지 2박 3일간 개최되며, 기조강연을 비롯해 구두·포스터 발표, 젊은 유기화학자상 시상 등 다양한 프로그램으로 구성하였습니다. 특히 전공 분야별 연구자 간 교류를 더욱 밀도 있게 이어갈 수 있도록 대학원생 및 박사후연구원 구두 발표 세션을 확대하였으며, 기업체 발표와 학생 포스터 세션 등도 내실 있게 준비하였습니다.

첫째 날 기조 강연에서는 Scott Miller(Yale University) 교수님의 세계적인 연구 성과 발표가 계획되어 있습니다. 둘째 날에는 학생들의 구두 발표 기회를 확대하였으며, 제20회 젊은 유기화학자상 수상자인 권선범(중앙대), 박윤수(KAIST) 교수님의 수상 강연이 준비되어 있습니다. 아울러 이필호(강원대) 교수님으로부터 한국 유기화학의 역사를 직접 들을 수 있는 소중한 시간도 마련하였습니다.

이번 하계워크숍은 무엇보다 젊은 연구자들과 학생들을 위한 자리입니다. 대학원생과 박사후연구원 여러분이 연구 결과를 직접 발표하고 활발히 토론하는 과정을 통해, 미래 유기화학의 주역으로 성장하는 소중한 계기가 되기를 바랍니다. 우수 발표자에게는 Junior ACP 학회 참가 자격과 함께 부상이 수여됩니다.

이번 워크숍의 성공적인 개최를 위해 애써 주신 운영진 여러분께 깊이 감사드립니다. 김현우(KAIST) 총무부회장, 이홍근 학술부회장, 이윤미(광운대) 기획부회장, 한수봉 산학연부회장을 비롯해 김현우(POSTECH), 박보영, 신광민, 한서정, 최준원, 성시광 운영위원 등 각자의 자리에서 실무를 맡아 주신 모든 분들께 감사의 마음을 전합니다. 아울러 재정적 후원과 행정적 지원을 아끼지 않으신 분과 회원님들과 기업체 관계자 여러분, 그리고 행사를 총괄해 주신 김은경 실장님과 도우미 학생 여러분께도 진심으로 감사드립니다.

유기화학은 시대가 요구하는 창의적이며 지속 가능한 해법을 제시할 수 있는 학문입니다. 이번 워크숍이 학문적 소통의 장이자 새로운 협력의 출발점이 되기를 바라며, 참석하신 모든 분들께 뜻깊고 유익한 시간이 되시기를 기원합니다.

감사합니다.

2026년 7월 6일

대한화학회 유기화학분과회 회장 **이영호**

2026년 제26회 대한화학회 유기화학분과회 하계 워크숍 프로그램

2026년 7월 6일 (월)

13:20-13:30	인사말 (컨퍼런스홀 ABEF) 이영호 (대한화학회 유기화학분과회 회장, POSTECH)
13:30-15:30	학생구두발표 I (컨퍼런스홀 ABEF_한국어, 컨퍼런스홀 C_한국어, 컨퍼런스홀 D_한국어)
15:30-17:00	포스터 세션 I (이벤트홀 AB)
17:00-17:20	Scifinder 교육 (컨퍼런스홀 ABEF)
17:20-18:20	기조강연 (컨퍼런스홀 ABEF) - Scott J. Miller (Yale University) Peptide-Based Catalysis[2.0]

2026년 7월 7일 (화)

09:30-11:45	학생구두발표 II (컨퍼런스홀 ABEF_영어, 컨퍼런스홀 C_영어, 컨퍼런스홀 D_영어)
11:45-13:00	점심식사 (도시락 제공)
13:00-15:00	학생구두발표 III (컨퍼런스홀 ABEF_영어, 컨퍼런스홀 C_한국어, 컨퍼런스홀 D_한국어)
15:00-16:30	포스터 세션 II (이벤트홀 AB)
16:30-17:30	젊은 유기화학자상 수상강연 (컨퍼런스홀 ABEF) - 권선범 (중앙대학교) Chemical Reaction Networks Operating Far from Equilibrium - 박윤수 (KAIST) Photocatalytic Single-atom Editing
17:30-18:10	특별강연 (컨퍼런스홀 ABEF) - 이필호 (강원대학교) 한국 유기화학의 역사: 대한민국을 빛낸 유기화학자
18:10-18:40	학생 수상자 시상 (구두 및 포스터) (컨퍼런스홀 ABEF)

2026년 7월 8일 (수)

09:00-11:00	유기화학분과회 발전방향 논의
11:00-11:10	폐회식

공동주관



KAIST InnoCORE AI-혁신신약연구단



성균관대 비대칭 촉매반응 디자인센터



충북대학교 G-LAMP 사업단



포항공과대학교 신개념 당화학반응 연구단



한국화학연구원 G-VIC 사업단



한국화학연구원 항생제 내성균 치료기술 전략연구사업단



한국화학연구원 차세대 모달리티 전략연구사업단

공식후원사



(주)세진씨아이

후원

CAS/ACS International	(주)비케이인스트루먼트 비케이인스트루먼트(BKI)	브루커코리아(주)
리가캠바이오사이언스	서강대학교 SOGANG UNIVERSITY 서강대학교 유기반응연구센터	(주)티엔제이테크 T&J TECH INC. (주)티엔제이테크
뉴젠테크	바이오타지코리아	시마즈 사이언티픽 코리아
써모 피셔 사이언티픽 케미칼	알토스	(주)이우과학교역 IWOO Scientific Corporation 이우과학교역
인터테크놀로지스	(주)자이코리아테크놀로지스 자이코리아테크놀로지스	캠신
캠원	수림교역	(주)퓨어캠
유한양행 중앙연구소	한국도레이과학진흥재단 재단법인 한국도레이과학진흥재단	사이플러스
한국여성과학기술인육성재단	카이랄 소재 핵심연구지원센터	뷰키코리아

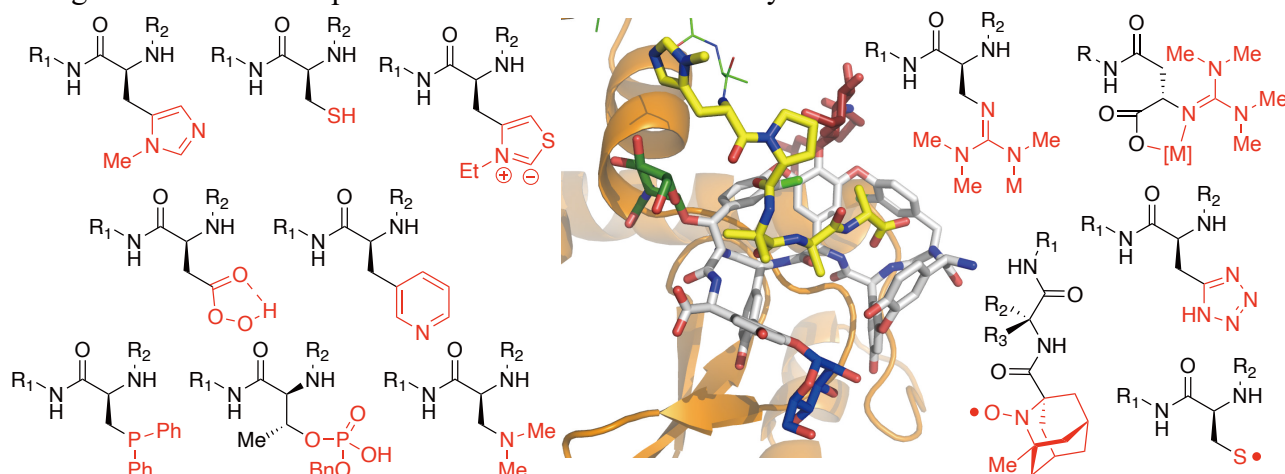
Peptide-Based Catalysis[2.0]

Scott J. Miller

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Asymmetric synthesis has advanced rapidly as a discipline as a result of powerful strategies, reagents and catalysts that have delivered control over stereochemical issues in new reactions. Transition metal complexes, organocatalysts and biocatalysts have all played critical roles. Peptide-based catalysts have also proven to be a central platform for the systematic study of multifunctional interaction arrays that underly selectivity in a wide variety of reactions. Design of new catalytic functionalities has been central to expanding the list of selective reactions and mechanistic paradigms that operate amidst the plethora of selectivity-defining interactions that are now signatures of peptide-catalyzed processes.^{1,2} This lecture will focus on some of the newest developments with peptide-based catalysts, with examples taken from fundamental studies, as well as some examples that have emerged from often unexpected collaborations with industry.



References

- [1] Metrano, A. J.; Shugrue, C. R.; Kim, B.; Chinn, A. J.; Stone, E. A.; Miller, S. J. *Chem. Rev.* **2020**, *120*, 11479-11615.



Scott J. Miller

Sterling Professor of Chemistry at Yale University (2023–present)

Professor at Yale University (2006–present)

Professor at Boston College (1996–2006)

Postdoctoral Fellow at California Institute of Technology (1994–1996)

Ph.D. at Harvard University (1989–1994)

M.A. at Harvard University (1989), B.A. at Harvard College (1985–1989)

Chemical reaction networks operating far from equilibrium

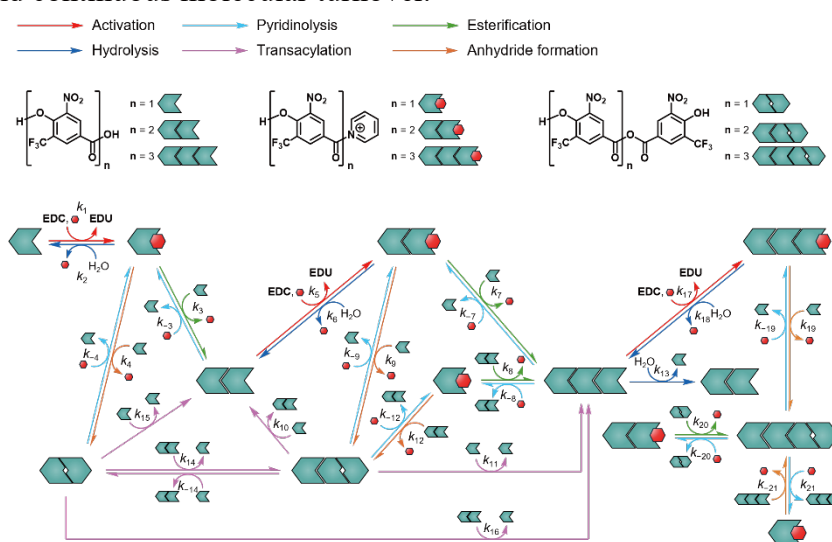
Sunbum Kwon

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In *What Is Life?* (1944), Erwin Schrödinger noted that living organisms avoid decay by remaining far from equilibrium. Cells accomplish this by acting as open systems, continuously drawing in energy and matter while exporting internally generated entropy to preserve their complex (supra)molecular structures. Over billions of years, living systems have harnessed this underlying thermodynamic drive through metabolism. This manifests as a sophisticated web of chemical reaction networks (CRNs) that precisely regulate flux, feedback, and continuous molecular turnover.

Mimicking these dynamic biological processes in synthetic systems remains a major challenge, as it requires designing artificial networks capable of driving energy and matter exchange among transient molecules. In this presentation, I will discuss key design strategies for integrated CRNs built from multiple organic reactions. Furthermore, I will introduce how these synthetic architectures are applied in Systems Chemistry to understand the fundamental principles of life-like behavior.



References

- [1] Lim, Y.; Park, G.; An, H.; Han, J.; Bae, J.; Kim, J.-H.; Lee, Y.;* Kang, K.;* Sung, J.;* Kwon, S.* *Angew. Chem. Int. Ed.* **2025**, 64, e202425407.



Sunbum Kwon

Assistant/Associate Professor at Chung-Ang University (2018–present)

Postdoctoral Associate at LMU München (2018–2018)

Postdoctoral Associate at IECB, Université de Bordeaux (2015–2018)

Postdoctoral Associate at KAIST (2013–2015)

Ph.D. at KAIST (2008–2013)

B.S. at KAIST (2003–2008)

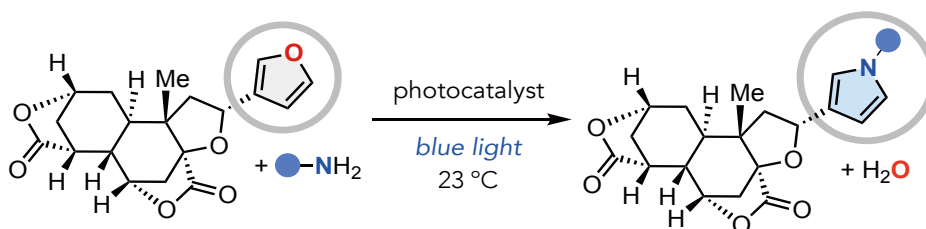
Photocatalytic Single-atom Editing

Yoonsu Park

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A single atom in aromatic heterocycles determines the unique properties and activity of functional molecules, such as natural products and pharmaceutical drugs. However, systematic evaluation of the single-atom effect has posed a synthetic challenge, and multi-step procedures have been inevitable based on classical approaches. In this talk, I will present single-step, catalytic protocols that directly exchange a single atom in an aromatic heterocycle with the isoelectronic congeners under redox-neutral conditions. Broad compatibility was observed with various substrates and nucleophiles that contain common functional groups encountered in the drug discovery process. The applicability in late-stage functionalization was studied, where synthetic short-cuts en route to the heterocyclic analogs were demonstrated. Mechanistic analyses suggested that radical-based ring-opening was initiated by polarity inversion, and further spin delocalization kinetically unlocks the underdeveloped pathway of direct atom exchange.



References

- [1] Kim, D.; You, J.; Lee, D. H.; Hong, H.; Kim, D.; Park Y. *Science* **2024**, 386, 99.



Yoonsu Park

Assistant/Associate Professor at KAIST (2022–present)

Postdoctoral Associate at Princeton University (2019–2021)

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한국 유기화학의 역사: 대한민국을 빛낸 유기화학자

이필호

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유기화학은 분자의 설계와 변환을 통해 의약, 농약, 기능성 소재, 에너지 및 첨단산업의 발전을 견인해 온 현대 화학의 핵심 학문 분야이다. 대한민국의 유기화학 연구는 지난 수십 년간 비약적인 발전을 이루며 세계적 수준의 연구 성과를 창출하는 단계에 도달하였다. 이러한 성장의 배경에는 새로운 반응과 합성 전략을 개척하고, 창의적 연구를 통해 학문적 지평을 넓혀 왔으며, 후학 양성과 학문 공동체 발전에 헌신한 선구적 유기화학자들의 노력이 있었다.

본 강연에서는 대한민국 유기화학 발전의 역사와 함께 그 과정에서 중요한 역할을 수행한 대표적인 유기화학자들의 학문적 업적을 조명하고자 한다. 천연물 전합성, 유기금속화학, 광화학, 비대칭 합성, 의약 화학, 기능성 분자 설계 등 다양한 연구 분야에서 세계적 경쟁력을 확보하며 한국 유기화학의 위상을 높인 연구자들의 주요 성과와 학문적 기여를 소개한다. 아울러 이들이 구축한 연구 문화와 인재 양성의 전통이 오늘날 한국 유기화학의 발전과 국제적 경쟁력 강화에 어떠한 영향을 미쳤는지를 살펴본다.

이번 강연은 대한민국 유기화학이 걸어온 도전과 성취의 여정을 되돌아보는 동시에, 미래 세대 연구자들이 새로운 유기화학의 지평을 열어가기 위한 비전과 방향을 함께 모색하는 자리이다. 오늘 우리가 누리고 있는 학문적 토대와 연구 환경은 수많은 선배 연구자들의 열정과 헌신, 그리고 끊임없는 도전의 결과물이다. 이들의 발자취를 되새기는 것은 단순히 과거를 기념하는 일이 아니라, 그 정신과 가치를 미래로 이어가는 일이다.

본 강연이 대한민국 유기화학 발전에 평생을 바친 선배 연구자들의 업적을 재조명하고 그분들께 깊은 존경과 감사의 마음을 전하는 뜻 깊은 시간이 되기를 바란다. 아울러 젊은 연구자들에게는 학문에 대한 열정과 도전 정신, 그리고 더 높은 목표를 향한 꿈을 심어주는 계기가 되기를 기대한다. 선배들이 개척한 길 위에서 새로운 세대가 더 큰 성취를 이루고, 대한민국 유기화학이 앞으로도 세계 학문 발전에 의미 있는 기여를 이어가기를 진심으로 희망한다.

참고문헌

- [1] 대한민국을 빛낸 유기화학자, 대한화학회 유기화학분과회, 자유아카데미, 2020.
- [2] 대한화학회 50년사, 대한화학회, 1999.



이필호

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학생구두발표 |

(7월 6일 (월))

| 컨퍼런스홀 ABEF (한국어)

13:30-13:45	Na Eun Kim, Hanyang University Regiodivergent and Stereoselective Hydrothiolation of Ynamides under Tunable Reaction Conditions	
13:45-14:00	Yoonji Heo, Chungbuk National University Mechanistic Insights into Structure-Tuned Dopamine Dimers for Enhanced Polydopamine Coating Performance	
14:00-14:15	Yeong Shin Ji, Hanyang University Ionic-Liquid-Promoted Dual Hydrogen-Bond Activation Strategy for the Synthesis of Diverse Fused Uracils	
14:15-14:30	Yeongwoong Lee, Ajou University Solving a 60-Year Bottleneck in Cyclic Allene Chemistry	
14:30-14:45	Chanyoung Jung, Kyungpook National University Photoredox Catalytic Performance of Iodinated Polydopamine	
14:45-15:00	Yumi Kim, Yeungnam University Discovery of a Novel Methyl Isocyanate (MIC) Surrogate	
15:00-15:15	Seung-Mi Choi, Dongguk University Pd-Catalyzed [3+2] Cycloaddition/Ring-Expansion Strategy for the Synthesis of Medium-Sized N-Heterocycles	
15:15-15:30	Yeehwan Kim, Seoul National University Total Synthesis and Biological Evaluation of Exiguamines	

컨퍼런스홀 C (한국어)

13:30-13:45	Chaewoon Jung, Hanyang University Asymmetric Dearomative Spirocyclization of Phenols Based on Silver-Pyridone Bifunctional Catalyst	
13:45-14:00	Dayong Song, Chungbuk National University Study on Chemoselective Synthesis of N,O- or O,O-Acetals via Palladium-Catalyzed Addition of Nucleosides into Alkoxyallenes and Its Application to Sustainable Functional Polymers	
14:00-14:15	Jinho Kim, Hanyang University Harnessing π -Interactions in Boronate Catalysis for Site-Selective Acylation with Highly Reactive Electrophiles	
14:15-14:30	Sung Jun Lim, UNIST Rational Design of Photoredox-Switchable Chalcogen Bonding for High-Contrast Solar Windows	
14:30-14:45	Yuna Song, Seoul National University NHC-CDC Ester Dication: Formation and Exploration of Unique Photoreactivity	
14:45-15:00	Hoyeon Jang, Korea University Molecular Probes toward Blood-Based Alzheimer's Disease Detection	
15:00-15:15	Youngrok Lee, KAIST Calcium-Triggered Helix Metamorphosis of a Cyclopentane-Based Oligoamide Foldamer	

컨퍼런스홀 D (한국어)

13:30-13:45	Soo-Ji Choi, Hanyang University Studies toward the Total Synthesis of Cephanolide and Ceforalide via Asymmetric 2-Pyrone Intramolecular Diels-Alder Reaction	
13:45-14:00	Gihyung Jang, POSTECH Synthesis of 3-C-branched furanose glycols via [2,3]-Wittig rearrangement of chiral acetals	

14:00-14:15	Junyoung Moon, Sogang University N-Acyl Benzisothiazolinones (N-Acyl BITS): A Versatile and Robust Scaffold for Acyl Transfer	
14:15-14:30	Joohyun Park, Ajou University Ir(triNHC) catalyzed upcycling of Poly(butylene terephthalate) into biodegradable polymer	
14:30-14:45	Hyo Seong Kim, Dong-A University Visible-Light-Mediated Synthesis of Tetrahydroquinolines via Electron Donor - Acceptor Complexes	
14:45-15:00	Seungho Kim, Kwangwoon University Ligand-Controlled Catalytic Hydroarylation of Allenes for Regioselective and Enantioselective Synthesis of Arylated Alkenes	
15:00-15:15	Yeon Hee Kim, Seoul National University of Science and Technology Cobalt-Catalyzed Alkyne Migratory Hydroboration	
15:15-15:30	Sukhyun Shin, Gachon University Towards a Formal Synthesis of Sinensilactam A	

학생구두발표 II

(7월 7일 (화))

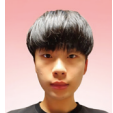
컨퍼런스홀 ABEF (영어)

09:30-09:45	Gyeongseon Choi, KAIST Photoredox-Catalyzed Chlorosulfamoylation of Alkenes Using Unsubstituted Sulfamoyl Chloride	
09:45-10:00	Soo Young Kim, Seoul National University Stereoconservative Nucleophilic Substitution	
10:00-10:15	Seongrok Heo, KAIST Synthesis of 3-desoxycollinoketone B and its ability to reduce Alzheimer-associated misfolded proteins	
10:15-10:30	Seungdae Park, Sungkyunkwan University PdH-Catalyzed Remote Ritter-Type Hydrofunctionalization of Alkenes via Electrochemical Oxidation	
10:30-10:45	Mardhiyah Hanifah, Pusan National University Visible-Light-Mediated Alkylation of Imines Using Alcohol as A Radical Precursor	
10:45-11:00	Eunbi Kim, Sogang University Acetals Beyond Protecting Groups for Diverse C-C Bond Formation via C-O Bond Activation	
11:00-11:15	Tae Kyung Ko, POSTECH Hydrogen Bond-Promoted C4-Selective Sulfenylation of Anilines via N-S Bond Homolysis	
11:15-11:30	Ekaterina Sokolova, Ajou University Sustainable CO2-based polymers for adhesive applications	
11:30-11:45	Seonghun Kim, Chungnam National University One Precursor, Two Pathways: Metal-Free Ionic and Radical Hydrosulfonylation Using Pyrimidylsulfones	

컨퍼런스 C (영어)

09:30-09:45	Jaehyun You, KAIST Photocatalytic furan-to-pyrrole conversion	
09:45-10:00	Alina Dzhaparova, Seoul National University Acid-Mediated Double Cyclizations for L-Region Expansion of PAHs: Divergent Mechanistic Pathways via Dehydrative Cyclization	
10:00-10:15	Minsoo Kim, KAIST Molecular-level reconstruction of electron-hole recombination from isolated radical ions	
10:15-10:30	Dong Hyeon Kim, Sungkyunkwan University Water-Compatible SuFEx-Active Linchpins for On-DNA Conjugation	
10:30-10:45	Jeong Kyeong Lee, UNIST Photoelectrochemical chemical transformation in dye-sensitized photoelectrochemical cells for lignin valorization	
10:45-11:00	Hyunshin Cho, Korea University DMSO-Ligated Pd(II)-Catalyzed Diastereoselective Oxidative Cyclization of Unactivated Alkenes with Allyl Alcohols for the Synthesis of Oxolanes Derivatives	
11:00-11:15	Yeonjoo Lee, DGIST Regiodivergent Cu-Catalyzed Double Protoborylation of 1,3-Enynes and trans-Monoborylation of (Z)-Aryl-1,3-Enynes	
11:15-11:30	Akash Tambe, Chung-Ang University Visible Light Induced EDA-Mediated Metal-Free Decarboxylative Heck Coupling towards Sustainable Stilbene Synthesis.	
11:30-11:45	Lavanya Basker, Hallym University Hydroxamate-Mediated Self-Assembly of Fe ³⁺ -BTH Complexes for Material-Independent Film Formation and Single-Cell Nanoencapsulation	

컨퍼런스홀 D (영어)

09:30-09:45	Sejin Park, KAIST Photoactive and Photoluminescent First-Row Transition Metal Complexes	
09:45-10:00	Hyunghwan Seo, Seoul National University Trifluoroethoxy Vinyl Sulfoxide: A Versatile Reagent for Divergent Synthesis	
10:00-10:15	Chungwoo Lee, KAIST Discovery and Synthesis of Flueggeosines D-F and Securingine J	
10:15-10:30	Fazsa Islamianti Machmud, Pusan National University Cp ₂ TiCl ₂ -Catalyzed Photochemical Rearrangement of Oxaziridines to Amides	
10:30-10:45	Su Hyun Ji, Sogang University Identification of 5,7-Dihydro-6H-pyrrolo[2,3-d]pyrimidin-6-one Derivatives as ENPP1 Inhibitors for STING Pathway-Mediated Immunotherapy	
10:45-11:00	Mugeon Song, GIST Regio-orthogonal single N-atom insertion into indoles via NO translocation	
11:00-11:15	Hee Jin Han, Korea University Nickel-Catalyzed Skeletal Editing of Benzothiazoles into Quinolines	
11:15-11:30	Nayeong Kim, Ewha Womans University Nickel-Catalyzed Alkynyl-Alkyl Cross-Electrophile Coupling via Ligand-Controlled Sequential Activation	
11:30-11:45	Donghoe Jung, Konkuk University Light-Driven Deaminative Nucleophilic Substitution via C(sp ³)-N bond Cleavage: Nucleophilic Transamination of Alkyl Amines	

학생구두발표 III

(7월 7일 (화))

컨퍼런스홀 ABEF (영어)

13:00-13:15	Geunyoung Choi, KAIST Catalytic Multiple Stereocontrol of Phosphorus and Carbon Stereogenic Centers in a Single Bond-Forming Operation	
13:15-13:30	Hyungwoo Choi, Seoul National University Photoinduced Multicomponent Difluoromethylation of Imines via Iron-Mediated LMCT	
13:30-13:45	Sarah Jang, KAIST Cyclopropenimine-Enabled Redox Control in Copper-Catalyzed Radical Cyclization to 3,3-Disubstituted Oxindoles	
13:45-14:00	Yoonho Lee, Sungkyunkwan University Ni-H Catalyzed Hydroacylation: A General Strategy for Accessing α -Substituted Carbonyl Compounds Using Acyl Fluorides	
14:00-14:15	Ahhyeon Choi, POSTECH Electrocatalytic Intramolecular Hydroamination for the Synthesis of Strained N-Heterocycles	
14:15-14:30	Huijeong Ryu, GIST Harnessing an Adaptive Agostic-to- π Relay for Pd-Catalyzed Asymmetric 1,4- and 1,2-Arylation	
14:30-14:45	Dohyun Kim, UNIST Cell Penetrable Autophagosome-Tethering Supramolecular Peptide Self-Assembly with Autophagy Flux Enhancement for Targeted Degradation	
14:45-15:00	Jiu Jeong, Chonnam National University Solvatomorphic Behavior of a Sequence-defined O, N-Linked Hexaurethane Helix	

컨퍼런스홀 C (한국어)

13:00-13:15	Junyoung Lee, Hanyang University Discovery of PKM2 Tetramerization Activators as Potential Therapeutics for Autoimmune Diseases	
13:15-13:30	Seung Soo Moon, POSTECH A de novo synthetic method towards cyclic oligosaccharides by way of Pd-catalyzed intramolecular asymmetric hydroalkoxylation of allenes	
13:30-13:45	Han Byeol Kim, Sogang University Electrochemical dearomatization of 2-naphthols for C-O bond formation	
13:45-14:00	Minwoo Park, Chonnam National University Photochemical Amide Synthesis from Nitroarenes	
14:00-14:15	Changha Kim, Institute for Basic Science (IBS) Photocatalytic Reconstruction of Bicyclo[1.1.0]butanes via Strain Release Oxygenation	
14:15-14:30	Dahun Kim, Incheon National University Mn-Catalyzed Aerobic Oxidative [3+2] Cycloaddition reaction using Azo/Hydrazide Redox	
14:30-14:45	Beopbo Kang, University of Ulsan Enzyme-Instructed Self-Assembly of ER-Targeting Peptides for Selective Modulation of Cancer Cell Fate	

컨퍼런스홀 D (한국어)

13:00-13:15	Daseop Jo, Hanyang University Tertiary-Site Selective Deoxygenation of Unsymmetrical Diols Enabled by Polarized Silyloxonium Activation	
13:15-13:30	Geon Kang, Chungbuk National University Electroreductive Divergent Hydrogenations of Alkynes to Alkenes or Alkanes	
13:30-13:45	Yonghoon Jin, POSTECH Axially chiral α -boryl-homoallenyl boronic esters as versatile toolbox for accessing centrally and axially chiral molecules	

13:45-14:00	Mincheol Park, Kyung Hee University Self-Association-Enabled Homo-EDA Activation for Visible-Light Aerobic Dehydrogenation of N-Heterocycles	
14:00-14:15	Hyunsun Jeong, Ewha Womans University Molecular engineering of IR820 based heavy-atom-free near-infrared photosensitizers for tumor theranostic application	
14:15-14:30	Hyeontaek Nam, DGIST NiH-Catalyzed Enantioconvergent α -Alkenylation of Carbonyl Compounds via Markovnikov Alkyne Hydronickellation	
14:30-14:45	Sun-Gil Park, Chungnam National University Total Synthesis of Pacharin, Bauhiniastatins 1-4, and Bauhinoxepins C-J with Structural Revision of Bauhinoxepin F	
14:45-15:00	Jaeseok Lee, Kangwon National University Discovery of a KLHL41 Ligand for Muscle Specific Protein Degradation	

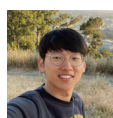
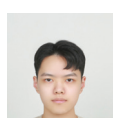
포스터 세션 I

(7월 6일 (월))

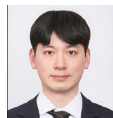
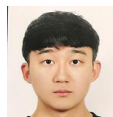
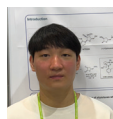
이벤트홀 AB (15:30–17:00)

P-1	Jia Xu, KAIST Electrochemical Strain-Release Amination of Azabicyclo[1.1.0]butanes Using Nitroarenes	
P-2	DongHun Kang, Hanyang University Development of a Fluorogenic Probe for Selective Detection of Cathepsin S	
P-3	Minsang Kang, KAIST Reconstructing N-Terminal Hydrolase Active Sites for Biomimetic Catalysis	
P-4	Taeseok Kang, Yonsei University Mechanistic Investigation of Catalytic Deaminative Cyanation of Primary Amines	
P-5	Byunghyun Ko, Seoul National University Application of bisNHC ligands in radical stabilization	
P-6	Yongjun Kwon, UNIST Chalcogen Atom Substitution in Organic Semiconductors for Developing Efficient and Stable Blue Phosphorescent OLEDs	
P-7	Junhyeok Kwon, UNIST Improving the Conductivity and Stability of Silver Nanowires Through Spontaneous Ligand Exchange for Joule Heating	
P-8	Doyoung Kim, KAIST Photoredox-Mediated Ring Opening of Aminocyclopropanes for the Synthesis of N-Acyl-N,O-Acetal-Linked Pyridines	
P-9	Minseop Kim, DGIST Cu-Catalyzed Stereo- and Regioselective Disilylation and Sequential Silylation/Borylation of CF ₃ -Containing 1,3-Enynes	
P-10	Minji Kim, Ewha Womans University General Approach to α -Branched Amines via Nickel-Catalyzed Alkylation of Imines with Primary, Secondary, and Tertiary Unactivated Alkyl Halides	

P-11	Sungtae Kim, UNIST Rational Design of Dual Atom Doped Graphene via Sonocavitation Strategy: Electronic Modulation for Ambient C-N Coupling	
P-12	Sunghyun Kim, Korea University An Activatable Dexamethasone-Prodrug Strategy to Eradicate Multidrug-Resistant Cancer	
P-13	Seri Kim, POSTECH HFIP-Mediated Metal-Free Synthesis of Tetrahydroisoquinolines	
P-14	Suhyun Kim, KAIST Design and Characterization of Metal-Foldamer Cages	
P-15	Seung Rok Kim, UNIST Cavitation-Induced Mn-O-C Bond Formation in MnO ₂ /Conductive carbon for Binder-free Zn-MnO ₂ Battery	
P-16	Aeyoung Kim, Hanyang University Cathepsin K-Responsive Turn on probe for Real-Time Monitoring of Osteoclast activity	
P-17	Sihyun Kim, Sogang University Synthesis of Redox Polymers Based on Acyl Azide-Functionalized Biimidazole-Osmium Complexes for Glucose Biosensors	
P-18	Ukhyeon Kim, University of Ulsan Visible-Light-Induced Photoreductive Degradation of Fe(III)-Catechol Hydrogel Networks	
P-19	Jeongmin Kim, Sogang University Direct Covalent Conjugation of Glucose Dehydrogenase with Benzisothiazolinone (BIT)-Functionalized Osmium Complexes	
P-20	Jeong An Kim, Seoul National University Pd catalyzed stereospecific spirocyclization	
P-21	Juhee Kim, Chonnam National University Synthesis of Non-Natural Urea Ligands for Biomimetic Organometallic Catalysts	
P-22	Ji-Woo Kim, Kunsan National University Chemoselective Photochemical Debenzylation of Amides	

P-23	Ji Woo Kim, Dongguk University Halogen-Mediated Divergent Intramolecular Hydroamination for the Synthesis of Pyrrolidine derivatives	
P-24	Taewan Kim, KAIST Towards the total synthesis of suffranidine A	
P-25	Tae Hyun Kim, Pukyong National University Light-Driven Redox Modulation of 9,10-Phenanthrenequinone for Amplified Radical-Based Reactive Oxygen Species Production	
P-26	Hangyoung Kim, KAIST Toward the Total Synthesis of Herpotriquinones	
P-27	Hanul Kim, POSTECH Regioselective HAT Mediated Direct Modification of Furanosides	
P-28	JongMin Na, Hanyang University NHC-Catalyzed Base-Controlled Chemodivergent Synthesis of γ - and δ -Lactone-Fused Uracils	
P-29	HeeHo Noh, KAIST Lithium Iodide-Mediated Bisfunctionalization of Azabicyclo[1.1.0]butanes with Two Electrophiles	
P-30	Dahyeon Park, Sogang University A Study on the Use of Hydroborated Polyisobutylene as an Initiator for Radical Polymerization	
P-31	Sangbin Park, KAIST Multistate Phyllanthidine-Azobenzene Hybrid Photoswitch with Time-Resolved Orthogonal Controllability	
P-32	SeoWoo Park, Hanyang University Development of N-hetroaromatics-Based PKM2 Activators for Multiple Sclerosis	
P-33	Seungbeom Park, KAIST Synthetic Studies Toward Flueggeosine G	
P-34	Sinyu Park, Kunsan National University Metal-Free Conversion of Non-Activated Amides to Esters	

P-35	Yunseul Park, Kongju National University Synthesis of Protocatechuic acid alkyl Ester Derivatives and Comparative Evaluation of Their Hydrophobicity-Dependent Anti-Inflammatory Activities	
P-36	Jiyeon Park, Korea Research Institute of Chemical Technology Design and synthesis of SARS-CoV-2 3CL protease inhibitors	
P-37	Eunji Baik, Sogang University Condition-Controlled Divergent Synthesis of α -Ketoamides and Amides from Acyl Chlorides via Ni/Photoredox Dual Catalysis	
P-38	Terim Seo, Sungkyunkwan University Lewis acid-catalyzed asymmetric allylation and Mukaiyama aldol reaction of 1,2-dicarbonyl compounds	
P-39	Suyeon Shin, Ewha Womans University Ligand-Controlled Switching of Selectivity in Nickel-Catalyzed Asymmetric Migratory Cross-Electrophile Coupling	
P-40	HyeonOh Shin, UNIST Observation of Excited State-Derived Photoluminescence Decay of Organic Sensitizer to Monitor Its Photo-Induced Charge Transfer Efficiency	
P-41	Eunbyeol Yang, UNIST Harnessing Oxidative Stress and Target Protein Modulation to Overcome Photodynamic Therapy Resistance	
P-42	YeEun Wang, POSTECH Additive-Controlled Regiodivergent C-H sulfenylation of Indoles	
P-43	Deokseon You, Hanyang University Development of fluorescent probes for cathepsin K using reverse design strategies	
P-44	JaeHyeon Yu, Kyung Hee University Regiodivergent Styrene-Nitrone [3+2] Cycloaddition via Preferential Styrene Oxidation under Iron(III) Photoredox Catalysis	
P-45	Gyeonghun Lee, Chung-Ang University Substituent-Guided Routing in Chemical Reaction Networks	
P-46	MinYoung Lee, Chonnam National University Control of Helical Folding Structures in meso-Oligourethanes	

P-47	Seok Beom Lee, Seoul National University Rapid alkene carboheterofunctionalization enabled by Photoredox/RLT Dual Catalysis	
P-48	Subin Lee, Inha University Stoichiometry-Controlled Divergent Synthesis of Pyrazolidine-Fused Tetrahydroquinolines and C3-Functionalized Quinolines via [3+2] Cycloaddition of C,N-Cyclic Azomethine Imines	
P-49	Seung Jun Lee, Hanyang University Aggregation-Induced Emission Properties of β -Aminovinyl Sulfides	
P-50	Yoojin Lee, KAIST Total Synthesis of Herpotrichones and Structure Modification Toward Anti-Neuroinflammatory Activity	
P-51	Yoojin Lee, UNIST Engineering a Photosensitizer for Precision Modulation of Biomolecular Condensates	
P-52	Yoonjung Lee, POSTECH A de novo synthetic study towards lipoarabinomannan	
P-53	JinWon Lee, Sungkyunkwan University Asymmetric SN1 Catalysis of Tertiary Carbenium Ions for Stereoconvergent Construction of All-Carbon Quaternary Stereocenters	
P-54	Hyeongyeong Lee, Ajou University Acid based catalytic strategy to upcycle Polylactic acid: Synthesis of 1,3 dioxolan 4 ones	
P-55	Hosung Lee, Sungkyunkwan University Stereocontrolled Assembly of Tetrahydrofurans via Chiral Oxazaborolidinium Ion-Catalyzed Formal [3+2] Cycloaddition of Allylsilanes and Aryl Glyoxals	
P-56	Sunwoo Im, Hanyang University Ascorbate-Mediated GLUT1 Targeting and Redox Perturbation Enhance Photodynamic Therapy in Cancer	
P-57	Seeun Lim, Kwangwoon University Regioselective Construction of All-Carbon Quaternary Centers via Allene Hydroalumination/Allylation	
P-58	SoHyun Jung, Seoul National University Enantioselective Organocatalytic One Pot Construction of Normorphan Skeleton: Total Synthesis of (+)-Peduncularine	

P-59	Ain Jeong, KAIST Toward the Total Synthesis of Verrucaric Acid	
P-60	Sungwook Jung, Korea University Elucidating the Luminescence Mechanism of a BN-Embedded Scaffold	
P-61	InYoung Jung, Kyungpook National University On-DNA Synthesis of γ -Ketonitriles for DNA-Encoded Library Construction	
P-62	Jiu Jeong, Chonnam National University Solvatomorphic Behavior of a Sequence-defined O, N-Linked Hexaurethane Helix	
P-63	Mingyu Jo, Pukyong National University Protonation-Activated Thiocarbonylated Coumarin Enables Hypoxia-Tolerant Type I Photodynamic Therapy	
P-64	Hyeongho Jo, University of Ulsan Enhanced Photodegradation of Microplastics by Sulfate Radicals Under Low Oxygen Condition	
P-65	Hoonhwi Cho, Sungkyunkwan University Catalytic C(sp ²)-SuFEx Coupling Enabled by Weakly Coordinating Anion-Based Silylium Lewis Acids	
P-66	Minju Jin, UNIST Reconsidering the Antiaromaticity of Cyclopent[hi]aceanthrylene as an Electron Acceptor	
P-67	Myeonggyun Choi, KAIST Toward the Synthesis of Prismatomerin	
P-68	Soowan Choi, Ajou University Ir(triNHC)-Catalyzed Waste Polyester Upcycling to α -Hydroxy Acids	
P-69	Yeonju Choi, Sogang University Synthesis of a New BIT-Based FRIPS-MS Tag for Peptide Sequencing	
P-70	Yujin Choi, Sogang University Ni-Catalyzed Cross-Electrophile Coupling of Unstrained Cyclic Ethers and Lactones via in situ Alkyl Iodide Formation	

P-71	EunSol Choi, Kunsan National University Direct Amide Formation from Ester Substrates via C-O Bond Cleavage	
P-72	EunJi Choi, Dongguk University O-Trapping-Enabled Reactivity Switching of Triazole-Derived α -Imino Carbenoids in Rh(II)/Pd(0) Dual Catalysis	
P-73	JaeHyuk Choi, Chungnam National University Stereoselective Synthesis of (E)-Alkenyl Sulfones via Regioselective Epoxide Ring Opening Enabled by In Situ Generated Sulfinates	
P-74	Jiwhan Choi, Ajou University CO ₂ -Derived Polyols as Sustainable Alternatives for Polyurethane Synthesis	
P-75	Sujeong Han, KAIST Divergent Synthesis of (Allo)Securinine & (Allo)Norsecurinine	

포스터 세션 II

(7월 7일 (화))

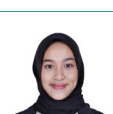
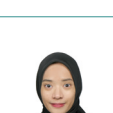
이벤트홀 AB (15:00–16:30)

P-1	Jongyeol Han, POSTECH A Synthetic Study towards Ezomycin A2	
P-2	Hyerim Yoo, University of Seoul Development of a Sequential Oxidative Dearomatization Strategy Toward the Total Synthesis of Herquiline A	
P-3	Seungwoo Hong, POSTECH HFIP-Promoted One-Pot Synthesis of Indolines and Pyrrolidines	
P-4	Junki Hong, Kunsan National University Photo-Induced Activation of Tetrahydroisoquinoline(THIQ)-Based Amides for Transamidation	
P-5	Akshada Andhale, Chung-Ang University Organo-photocatalyzed Fluoromethylative Dimerization of Allenes	
P-6	Chaeyoung Ryu, Kyung Hee University Aliphatic Dicarboxylate Linkers in MOFs: Perspectives on Coordination Dynamics and Ligand Exchange	
P-7	Flor Jazmin Cortez Hernandez, POSTECH HFIP-Enabled Benzyl Cations Stabilization for Paracyclophene Synthesis	
P-8	Dakyong Koh, Sogang University Metal-Free Asymmetric Synthesis of Chiral o-Aminoaryl Compounds via Benzyne-Based Multicomponent Reactions	
P-9	Daeseong Kim, Pukyong National University Multifunctional D-A-D Photomaterials: Steric Engineering for Advanced Phototherapy	
P-10	Divya Shrestha, Yeungnam University Rhodium-Catalyzed C-H Activation/Annulation of 2-Benzylquinazolinones with Ketones for Diversely Functionalized Pyrrolo[2,1-b]quinazolinones	

P-11	Dohoon Cha, Hanyang University Photocatalytic Degradation of Lignin Model Compounds under Mild Conditions	
P-12	Donghoon Park, POSTECH A synthetic study towards mannopeptimycin ☒	
P-13	Doyun Park, Hanyang University Asymmetric Thio-Allylation of 2-Imino-3-Diazoindolines	
P-14	Eunseo Sim, Sogang University Carbamoylation of Aryl and Benzyl Chlorides by Direct C-H Functionalization of Formamide Derivatives via Ni/Photoredox Catalyzed Cross-Coupling	
P-15	Eunyeong Song, UNIST Bias-Free Dye-Sensitized Photoelectrochemical Cells with Anodic Valorization mediated by ABNO in Acidic Conditions	
P-16	Ghanyatma Adi Baskoro, University of Ulsan Visible-Light-Photoreductive Disassembly of Fe(III)-Phytic Acid Nanoshells Facilitates On-Demand Cargo Release on Cell Surface	
P-17	Gihoon Jo, Chung-Ang University Electrochemical 1,2-Diamination of Styrenes	
P-18	Gwangsu Yoon, UNIST Molecular Design Strategy for Iridium(III)-based Photosensitizers to Enhance the Phototoxicity Index and Efficacy of Photodynamic Therapy	
P-19	Gyuri Park, Inha University Synthesis and utilization of N-silyllallenamines via hydrosilylation of conjugated imino alkynes	
P-20	Sangmyung Han, Seoul National University Direct access to quinoline-chalcone hybrids through iron-catalyzed aerobic oxidative sp ³ C-H functionalization of unactivated alkylquinolines	
P-21	Hee-yun Park, Hanyang University Studies toward the Total Synthesis of (-)-minovincine and (-)-vindoline via a Tandem Olefin Isomerization/Intramolecular Diels-Alder Reaction	
P-22	Hogeol Jeong, Seoul National University Enantiodivergent Synthesis of α -Fluorinated Quaternary Centers via Pd-Catalyzed Stereospecific Allylative Suzuki Cross-Coupling	

P-23	Hyemin Ko, Chung-Ang University Nickel-catalyzed Hydroamination of allenes	
P-24	Hyeon Moon, GIST Catalytic, stereodivergent, diastereospecific dichlorination and site-selective syn-interhalogenation of alkenes via traceless stereo-modulation	
P-25	Hyeonji Kim, Hanyang University Development of New Therapeutic Agents for NTM Infections	
P-26	Hyunjeong Lee, Kyung Hee University Ni-Catalyzed Cross-Coupling Strategy for Ketimine Synthesis from Iminopyridinium Salts	
P-27	Hyunjoon Kim, KAIST Prediction of Supramolecular Folding via Hierarchical Boltzmann Adaptive Sampling	
P-28	Hyunjun Bae, Pukyong National University High-Precision Imaging of β -Galactosidase Using an Enzyme-Activated Ratiometric Fluorescent Probe	
P-29	Inseon Yang, KAIST Expanding the Redox Boundary of Reductive Hydrazine Chemistry: Selective Partial Reduction of Furans Enabled by Alternating Polarity Electrolysis	
P-30	Jacob Emmanuel Sadorra, KAIST Toward the Total Synthesis of Securingine K	
P-31	Jaehyeok Choi, Seoul National University of Science and Technology Cobalt-Catalyzed Sonogashira Coupling with Aryl Triflates	
P-32	Jaehyeok Choi, Dong-A University Synthesis of Tetrahydroquinolines from Imines and Alkenes via [4+2]-Cycloaddition Reaction	
P-33	Jeongmin Park, Pusan National University Photocatalytic Giese-Type Addition of α -Alkoxy Methyl Radical Generated from Benzyl Alcohol	
P-34	Jeongeun Yoon, Chung-Ang University Nickel-Catalyzed β -Methyl Vinylation and Ligand-Controlled Divergent Diene Synthesis via Allylic Amines as Masked Alkenyl Electrophiles	

P-35	Jeongwon Son, Pukyong National University Minimal Substituent Engineering of Coumarin Thiosemicarbazones for Enhanced Fluorescence, Cu ²⁺ Detection, and Anticancer Activity	
P-36	Jihyeon Yun, UNIST Ir(III)-Based Photosensitizer inducing Immunogenic Cell Death via Photodynamic Therapy	
P-37	Jihyun Lee, Ewha Womans University Self-Assembling Nonhomodimeric Cyanine Photosensitizers for Efficient Tumor Targeting and Type I Photodynamic Therapy	
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충북대학교 G-LAMP 사업단

미래 에너지 융복합 연구단

미래 에너지, 기초과학에서 답을 찾다

물질·에너지 과학 분야

세계 최고 수준의 거점 연구소로 도약합니다.



사업단 소개

G-LAMP 사업단은 대학의 연구기반을 강화하고 우수 신진연구인력을 적극 활용하여 공동연구체계를 활성화하기 위해 신설되었습니다.

기초과학 10개 분야 중 물질·에너지과학 분야에 선정되어 총 5년 (24.9.1.~29.8.31.) 동안 연구비 250억 원 내외의 예산을 지원받습니다.

『첨단 기초과학 융합 연구소』를 중심으로 다양한 연구소와의 융·복합 연구를 통해 시너지를 창출하고, 전문연구인력·연구기술·시설장비·인프라 통합을 추진합니다.



연구분야

ABC (Advanced-Basic-Convergence) 연구소를 중심으로 4대 연구분야를 융합·연계하여 미래 에너지 혁신 연구를 선도합니다.



천연수소

지속가능한 수소에너지 자원 탐사 및 활용 연구



이차전지

차세대 고성능·고안전성 에너지 저장 시스템 개발



유무기에너지소자

고효율·고기능성 유무기 에너지 소자 및 소재 연구



생체고분자에너지

생체고분자를 이용한 에너지 소재 및 바이오 융합 연구

연구인력·연구기술·시설·장비 인프라 통합을 통한 융·복합 시너지 창출



주요 활동 및 성과



국제 재생에너지 및 전기유기합성 심포지엄 개최



해외 석학 초청 세미나 및 연구 교류 활성화



국내외 공동연구 및 글로벌 네트워크 구축



우수 연구성과 창출 및 학술논문 발표 확대



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→ 미래 에너지 혁신을 이끄는 연구 플랫폼



충북대학교
G-LAMP 사업단
G-LAMP RESEARCH CENTER



충북 청주시 서원구 충대로 1
S1-3, 101호



043-249-1770, 1767~1768



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위대한 기업으로 나아가는 길.
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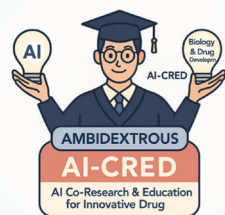
유한양행

AI-CRED FELLOWSHIP

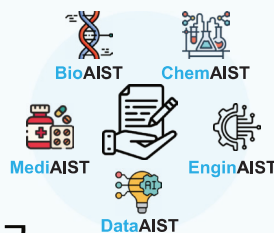
AI- Co-Research & Education for Innovative Drug

AI와 신약개발을 통합적으로 설계하는 '양손잡이형' Co-Researcher 인재양성 프로그램
AI 기반 혁신신약 및 약물전달 新모달리티 창출을 통한 신약 개발
박사후 연구원 중심의 창의적 연구 지원

AI-CRED Fellows



박사후 연구원의 독자적 연구 제안서



포닥 중심의 창의적이고
자율적 연구 지원

심사 및 선정

“2인 이상의 다학제
멘토 페어링”

Digital



Design



Delivery



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Open!

Closed

Open!

• 개인 융합: 포닥 1인 + 멘토 2인

연구비: 0.4~0.5억/년

• Cross-IST: 포닥 1인 + 멘토 2인

연구비: 0.5~0.6억/년

(다른 IST 소속멘토)

• 팀 기반 융합: 포닥 2~3인 + 멘토그룹

연구비: 1.0~2.4억/년

• 산학연 연계: 포닥 1인 + 출연(연)/기업 멘토 포함

연구비: 0.5~0.6억/년

*최종선발 인원 2명 내외

Notice

- 최대 계약기간 2029년 12월
- 2명 이상의 다학제 멘토 페어링 필수

연봉 9천만원 + 타 과제 중복참여 가능 + 개인 연구비

(4대 보험 등 법적 부담금 포함)

문의

-AI-CRED 김선영 박사
(sun90young@kaist.ac.kr)

-<https://sites.google.com/view/aicred/>



**지원 상세 내용 홈페이지 참조

동남권역 R-WeSET사업단

(이공계 여성인재 양성사업단)

WⁱSET 동남권역 R-WeSET사업단



※동남권역 R-WeSET 사업단은 '복권기금'으로 운영되고 있습니다.

R-WeSET

설립목적

여성과학기술인력 육성, 지원 활성화 및 제도, 환경 개선을 통해 우수 여성과학기술인재를 양성, 활용하여 국가 과학기술 발전에 기여

사업목표

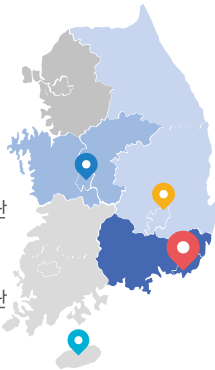
동남권역 신산업, 신기술 분야 생애주기별 교육을 통한 이공계 여성인재 양성 및 활용으로 국가 경쟁력 극대화

- 동남권 미래 신산업 수요 대응 전략적 유입, 성장, 정착
- 동남권 젠더혁신 기본 여학생 교육 모듈 개발
- 동남권 신기술 적응력 향상 및 글로벌 역량 제고
- 공격적인 이공계 여학생 환경 개선과 취업촉진

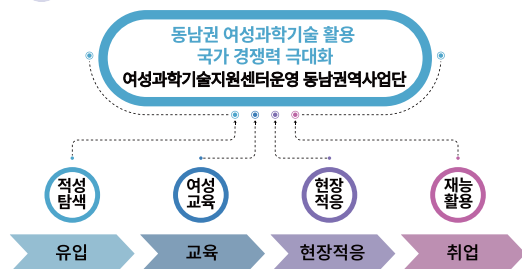


R-WeSET 지역 네트워크

- 동남권역 R-WeSET 사업단**
주관 : 부경대
참여 : UNIST, 신라대, 인제대
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참여 : 순천향대, 한국교통대
- 대경강원권역 R-WeSET 사업단**
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참여 : 대구대, 가톨릭관동대
- 호남제주권역 R-WeSET 사업단**
주관 : 제주대
참여 : 목포대,



동남권역 R-WeSET 사업단



여중고생 프로그램

미래 신산업 수요대응 전략적 유입

주니어 팀플 멘토링(JPM), 여학생 공학체험 주간(GEW)

젠더혁신 여중고생 교육모듈 개발

Women In Science(WIS) 과학문화 확산사업

신기술 적응력 향상 및 글로벌 역량

BTS(Busan Technology Science), GTS, UTS 체험교실

여중고생 환경개선과 진학촉진

Women In Science(WIS) 과학문화 확산사업

여대생 프로그램

미래 신산업 수요대응 전략적 성장, 정착

4차 산업혁명 IoT, AI 교육, 기업 맞춤형 커리어 쌓기, 해양로봇 아카데미, 기업연계 여대생 팀프로젝트

젠더혁신 여대생 교육모듈 개발

여성 공학교육 워크숍, 부경 애플 프로그램 아카데미

신기술 적응력 향상 및 글로벌 역량

여대생 산업인턴 지원 프로그램, 우먼 엔지니어 프로페셔널

여대생 환경개선과 취업촉진

엘리트 여대생 선발활동, 이공계 여학생의 날, 이공계 여대생 기업연계 취업멘토링

미취업자 프로그램

여성과학기술인 R&D 경력복귀 지원사업

지원내용

경력단절 여성과학기술인 채용 및 연구개발 참여를 위한 인건비 및 연구비 등 지원

지원금액

학석사 2,100만원, 박사 2,300만원 / 각 최대 3년 지원

지원대상

인력 이공계 학사이상 학위 취득자, 사업신청일 기준 고용보험 미가입자
기관 과학기술분야 연구기관 (기업, 대학, 정부출연연구소 등)

신청방법

W브릿지에서 온라인 접수로 사업신청
(<https://www.wbridge.or.kr>)





주식회사 퓨어켐

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Drug
Development

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Drug Development

하이드로젤 재생치료제 개발
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공익법인 한국도레이과학진흥재단 (Korea Toray Science Foundation)

과학 진흥과 인재 육성으로 사회에 공헌

- 화학 및 재료분야 연구개발에 대한 지원으로 한국 과학기술 발전에 기여
- 과학자·공학자에 대한 시상, 연구기금 지원 및 이공계 장학 후원, 학술진흥
- 도레이그룹의 일본 및 아세안 과학진흥재단들과 글로벌 연계 추구

주요 목적사업

과학기술상

화학 및 재료의 기초/응용 분야 2명
상금 1억원

신진 연구자 펠로십

화학 및 재료의 기초/응용 분야 5팀
연구비 5천만원/년 (최대 3년) 지원

이공계 장학 후원

학기당 15명, 인당 최대 330만원

과학문화 학술진흥

학회 후원 실시

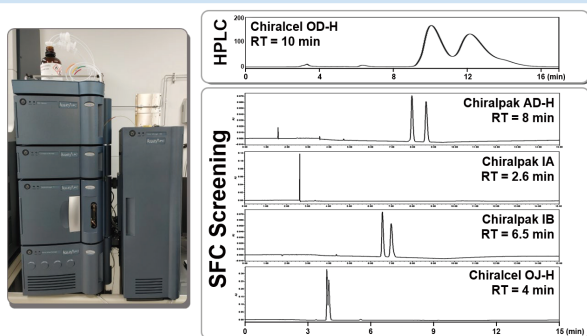
※ 과학기술상 및 펠로십 : 매년 4~6월 공모 실시, 10월 시상

Strategic Direction of Research

- ◆ Develops new analysis methods to rapidly and accurately measure the properties and functionality of chiral materials
- ◆ Provision of high-efficiency chiral analysis services and promotion of joint research utilizing center equipment

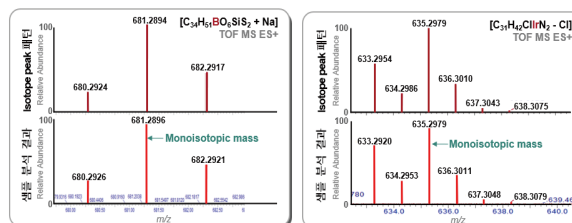
[Supercritical Fluid Chromatography (SFC)]

Enantioselectivity Evaluation of Chiral Pharmaceutical Compounds via SFC



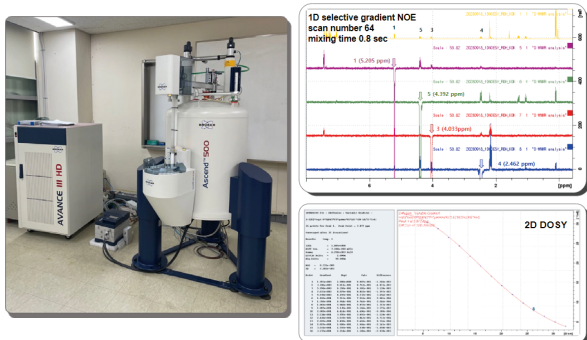
[SFC-High Resolution Mass Spectrometer]

Mass Spectrometric Analysis of Chiral Pharmaceutical Compounds Using SFC-HRMS



[Nuclear Magnetic Resonance Spectrometer]

Molecular Structure Elucidation of Chiral Compounds by NMR



(Excluding VAT)

Item	Unit	Internal (Joint Research)	External (Non-SKKU)
HR-MS Analysis	Sample	32,000 KRW	40,000 KRW
Additional Data Processing (2h, fragment confirmation)		30,000 KRW	40,000 KRW
Express Analysis		70,000 KRW	80,000 KRW

* Express Analysis: For up to 5 samples, analyzed within 24 hours of arrival



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차세대 모달리티 전략연구사업단

차세대 모달리티 기반 난치성 질환 혁신 신약개발 플랫폼

기존 치료의 한계를 넘어, 질병 원인을 정밀하게 제어하는 차세대 모달리티 원천기술을 개발합니다.

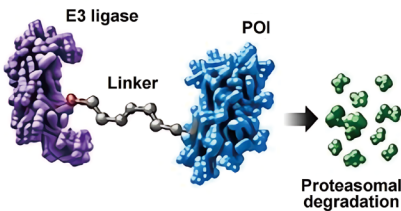
표적단백질분해, 약물접합체, 근접유도 기반 치료기술을 중심으로 난치성 질환 치료를 위한 혁신 신약 후보물질을 도출합니다.

3대 핵심 연구 분야

01 표적단백질분해 기술

(TPD, Targeted Protein Degradation)

PROTAC, Molecular Glue, ATTEC, Chaptac 기반 분해 기술을 통해 질병 유발 단백질을 선택적으로 제거하는 신약 플랫폼 구축

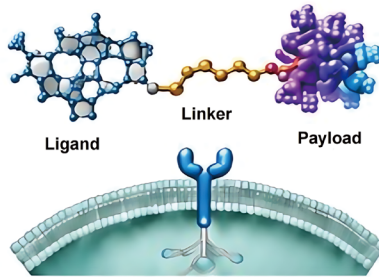


- ✓ PROTAC, Molecular Glue, ATTEC, Chaptac 기반 분해 기술 개발
- ✓ 다양한 E3 ligase ligand 및 분해제 라이브러리 구축
- ✓ 분해 효능(DC₅₀, D_{max}) 및 선택성 평가
- ✓ 암, 면역, 난치성 질환 타깃 확장

02 저분자-약물접합체 기술

(SMDC, Small Molecule-Drug Conjugate)

질병 세포에 선택적으로 약물을 전달하는 저분자 기반 접합체 플랫폼 개발

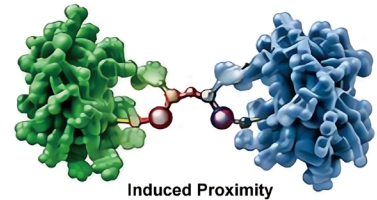


- ✓ 암세포 선택적 리간드 발굴
- ✓ 독성 payload 및 linker 최적화
- ✓ 세포 선택성 및 약효 · 약물성 평가
- ✓ ADC 한계를 보완하는 정밀전달 기술 확보

03 신규 근접유도모달리티 기술

(Induced Proximity Modality)

두 생체분자 또는 단백질 복합체의 인위적 근접화를 통해 새로운 약리작용을 유도하는 차세대 치료기술 개발

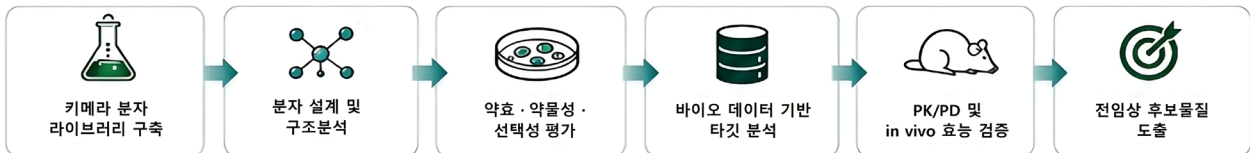


기능 조절 / 단백질 분해 / 신호차단 등 새로운 약리작용 유도

- ✓ RIPTAC, TCIP 등 신규 근접유도 기반 치료전략 개발
- ✓ 질병 관련 단백질 · 세포 기능 제어
- ✓ 기존 억제제 중심 신약개발 한계 극복
- ✓ 신규 작용기전 기반 first-in-class 후보물질 창출

통합 연구 플랫폼

의약화학 × 생물학 × 데이터 기반 통합 연구체계



첨단 연구기술과 통합 분석플랫폼을 기반으로 차세대 모달리티 신약 후보물질을 신속하고 효율적으로 개발

기대성과

- 차세대 모달리티 기반 원천기술 확보
- 난치성 질환 대상 선도물질 · 후보물질 도출
- 전임상 후보물질 개발 및 기술이전 연계
- 국내 신약개발 생태계 고도화
- 글로벌 경쟁 가능 후보물질 기술 창출

난치성 질환
치료를 위한
혁신 신약
개발

사업단의 강점

- 한국화학연구원 신약정보기술연구센터의 축적된 신약개발 역량과 인프라 활용
- 의약화학, 생물학, 데이터과학 전문연구진의 융합연구 수행
- 독자적 라이브러리 및 분석 플랫폼 보유
- 산 · 학 · 연 네트워크 및 기술이전 연계 강화
- 글로벌 신약개발 트렌드에 부합하는 차세대 모달리티 집중 연구

표적단백질분해에서
근접유도 치료기술까지,
혁신 신약개발의
새로운 패러다임



ANTIBIOTIC RESISTANCE THERAPEUTIC TECHNOLOGY RESEARCH GROUP

항생제 내성균 치료기술 전략연구사업단

다제내성균 대응 항생제 신속 개발을 위한 연구 가속 플랫폼

병원 내성 균주 감염증(요로감염·폐렴증) 치료제 전임상 후보물질 2종 도출을 목표로,
DEL 스크리닝·세포막 투과 기술·AI 작용기전 예측·동물실험 대체 약효평가를 통합한 신속 개발 플랫폼을 구축합니다.

4대 세부과제

01	02	03	04
다제내성 박테리아 항생제 전임상 후보물질 ▶ 그람음성균 항생제 유효물질 발굴·최적화 ▶ 항생제 업사이클링, 하이브리드 항생제 막 타겟 항생물질, 항생펩타이드 개발 ▶ 전임상 후보물질 2종 도출	박테리아 세포막 투과 기술 개발 ▶ LC-MS/MS 기반 세균 내 약물 축적량 측정 ▶ 화합물 구조 기반 약물 투과 예측 모델 개발 ▶ LNP 기반 항생 약물 전달 기술	AI/데이터 기반 작용기전 예측 모델 ▶ 타겟 맞춤형 결합모델 예측 AI 모델 ▶ Label-free 이미징 기반 기전 예측 ▶ 전사체/단백질체/대사체 분석 기전 검증 ▶ 임상내성균주 이용 항생제 내성 기전 연구	신속 전임상 후보물질 도출 인프라 ▶ 타겟/약효 동시 스크리닝 고체상 DEL 구축 및 스크리닝 ▶ Hollow-fiber infection model (HFIM) 약효 평가 시스템 ▶ 오가노이드 기반 동물대체 감염모델

연구 가속 플랫폼

하나의 통합 연구 플랫폼에서 유기적으로 연결되는 4대 세부기술



참여기관

산·학·연·병 협력 연구체계 — 총 8개 기관 참여

한국화학연구원 (KRICT)	한국과학기술연구원 (KIST)	한국생명공학연구원 (KRIBB)	이화여자대학교	한국파스퇴르연구소 (IPK)	연세의료원	리가켄바이오 사이언스	엔파티클
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신개념 당화학 반응 연구단

CENTER FOR DE NOVO CHEMICAL GLYCOSYLATION

포항공과대학교 화학과 이영호 교수 연구실



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E-mail | yhrhee@postech.ac.kr
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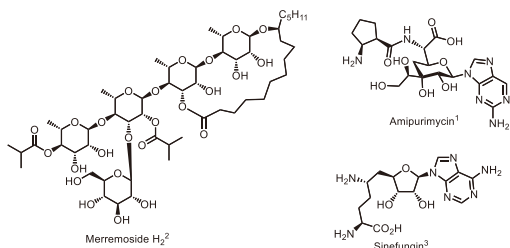
Ph.D. student & post-doc positions are available!

연구의 목표

당화 결합은 다당류나 뉴클레오사이드 등 생리 활성/기능성 물질의 기본 골격을 이루고 있으며 생명 현상의 화학적 고찰에서 매우 중요한 역할을 한다. 온화한 조건에서 수행되는 입체선택적이면서도 범용적인 당화 결합의 형성은 유기 화학 분야에서 가장 도전적인 주제 중 하나로 잘 알려져 있는데 이는 반응에 참여하는 헤테로원소 친핵체들의 낮은 반응성 및 당화 반응을 통해 얻어지는 아세탈 골격의 화학적 불안정성 때문이다. 본 연구단에서는 이러한 고전적인 화학적 당화 반응의 문제를 새로운 개념의 연속 금속 촉매 반응들을 통하여 해결하고 당화학 분야에서 새로운 패러다임을 구축하고자 한다. 또한, 이 방법론을 다양한 구조/크기와 기능을 가지는 당화합물 합성에 적용하고자 한다. 이러한 연구는 궁극적으로 질병을 치료할 수 있는 새로운 의약후보화합물 개발 및 생명 현상을 탐구할 수 있는 화학적 탐침의 발굴로 확장될 수 있을 것이다.

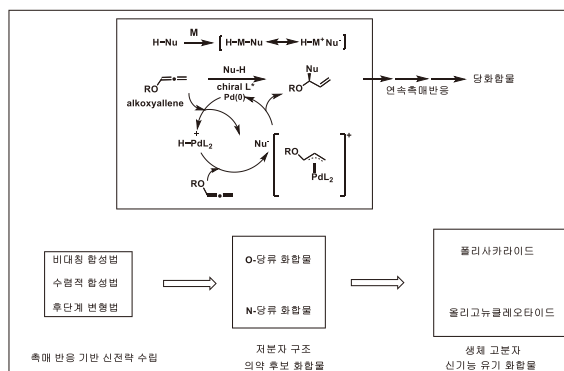
대표 연구내용

Examples of recently synthesized glycosides in the lab

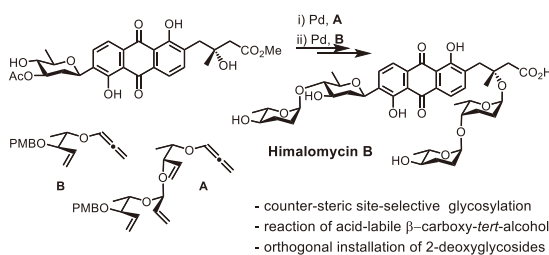


¹ Org. Lett. **2024**, 26, 8537 ² Org. Lett. **2024**, 26, 602
³ Org. Lett. **2024**, 26, 3957

연구 기본 개념

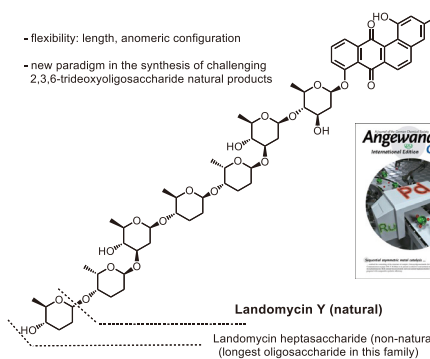


Total synthesis of Himalomycin B



J. Am. Chem. Soc., **2025**, 147, 14432

Flexible synthesis of Landomycin Y and its non-natural analogues



Angew. Chem. Int. Ed., **2020**, 59, 2349

제26회 대한화학회 유기화학분과회 하계 워크숍

학생구두발표 및 포스터 초록

Regiodivergent and Stereoselective Hydrothiolation of Ynamides under Tunable Reaction Conditions

Na Eun Kim, Seung Jun Lee and So Won Youn*

Department of Chemistry, Hanyang University, Seoul 04763, Korea

E-mail: sowony73@hanyang.ac.kr

Vinyl sulfides are important structural motifs in pharmaceuticals and advanced materials, but their synthesis remains challenging because regio- and stereoselectivity must be controlled simultaneously. Herein, we report an efficient and atom-economical hydrothiolation of ynamides that enables regiodivergent access to α - or β -aminovinyl sulfides by simply changing the reaction conditions. In particular, β -selective addition is achieved under catalyst-free conditions using ionic liquids as the reaction medium, while α -selective addition proceeds under Lewis acid catalytic conditions. Mechanistic studies suggest that the dual hydrogen-bonding ability of ionic liquids modulates the electronic nature of ynamides, thereby promoting hydrogen-bond-mediated β -addition. This method exhibits a broad substrate scope, high yields, and excellent regio- and stereoselectivity, offering a practical and sustainable strategy for solvent-controlled C–S bond formation.

Mechanistic Insights into Structure-Tuned Dopamine Dimers for Enhanced Polydopamine Coating Performance

Yoonji Heo,¹ Sung Min Kang,^{1*} Min Kim^{2*}

¹*Department of Chemistry, Chungbuk National University, Cheongju, Korea*

²*Department of Applied Chemistry, Kyung Hee University, Yongin, Korea*

E-mail: smk16@chungbuk.ac.kr; minkim@khu.ac.kr

Catechol-based molecules, particularly dopamine, are widely utilized as precursors for polydopamine coatings formed *via* oxidative self-polymerization.^[1,2] In this study, we systematically altered the molecular structure of dopamine to prepare a series of dimeric derivatives featuring diverse linker motifs and aromatic architectures, and investigated their coating behavior with an emphasis on the underlying formation mechanism.^[3]

Mechanistic analysis indicates that oxidative activation of accessible catechol units initiates radical-mediated coupling, which governs subsequent nucleation and film growth. Dopamine dimers with suitably exposed catechol groups facilitate rapid generation of reactive intermediates, leading to accelerated deposition kinetics. In addition, extended aromatic segments promote intermolecular interactions such as π - π stacking, enhancing aggregation and contributing to increased film thickness and structural integrity. In contrast, derivatives with limited catechol accessibility disrupt the initiation step and significantly suppress coating formation.^[3]

These findings demonstrate that rational structural modification of dopamine dimers not only modulates coating efficiency but also provides mechanistic control over polydopamine film formation, offering a molecular-level strategy for designing advanced surface-coating materials.

References

- [1] Liebscher, J. *Eur. J. Org. Chem.*, **2019**, 2019, 4976-4994.
- [2] Heo, Y.; Ji, M.; Ryu, C. Y.; Kim, H.; Choi, I.; Kang, S. M.; Kim, M. *Eur. J. Org. Chem.* **2025**, 28, e202401035
- [3] Heo, Y.; Kim, H.; Lee, J.; Ryu, C. Y.; Kim, C.; Kim, M.; Kang, S. M. *Langmuir*, **2026**, 42, 9501-9508.

Ionic-Liquid-Promoted Dual Hydrogen-Bond Activation Strategy for the Synthesis of Diverse Fused Uracils

Yeong Shin Ji and So Won Youn*

Department of Chemistry, Hanyang University, Seoul 04763, Korea

E-mail: sowony73@hanyang.ac.kr

Recently, we developed a *t*-BuOK-promoted [4+2] annulation–dehydration cascade that enables the efficient synthesis of 2-pyridone-fused uracils via a vinylogous enolization strategy involving *o*-quinodimethane (*o*QDM) dienolate intermediates. To enhance the practicality and synthetic utility of this transformation, we replaced the strong base with imidazolium-based ionic liquids as alternative activators. In this system, the ionic liquid functions as a dual hydrogen-bonding activator, simultaneously engaging both remotely enolizable uracils and isocyanates. As a result, the annulation–dehydration cascade proceeds efficiently under metal-free and base-free conditions. This operationally simple and environmentally benign protocol provides a versatile platform for the synthesis of diverse 2-pyridone-fused uracils in high yields. Furthermore, the strategy is readily extended to alkene and alkyne dienophiles to afford structurally diverse carbocycle- and benzo-fused uracils.

Solving a 60-Year Bottleneck in Cyclic Allene Chemistry

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²*Department of Chemistry, Ajou University, Suwon 16499, South Korea*

Email: yyy1519@ajou.ac.kr

Abstract

Arynes, cycloalkynes, and cyclic cumulenes use strain to drive reactivity. In cyclic allenes, strain does something more: it creates chirality. Cyclic allenes transform cycloaddition from simple bond formation into a zero-to-three stereocenter-generating event, uniquely creating one chiral center from the strained ring itself while establishing up to two more at the cycloaddition interface. Yet this potential can reshape stereoselective synthesis only if strain-induced chirality can be accessed in a single enantiomeric form. This requirement has remained the field's central bottleneck: 1) enantioenriched precursors are difficult and costly to prepare, and 2) known asymmetric routes have not demonstrated clear scalability. Thus, the defining stereochemical advantage of cyclic allenes has remained more a conceptual promise than a practical synthetic tool.

Marking the 60th anniversary of Wittig's 1966 validation of cyclic allenes, this study addresses a long-standing problem that has limited the stereochemically faithful use of these fleeting strained intermediates. With practical access to enantioenriched cyclic allene precursors in hand, the problem proved to extend beyond precursor synthesis itself: before the cyclic allene is fully formed, stereochemical erosion occurs through a hidden racemization pathway governed by precursor design. This presentation traces the solution to this 60-year bottleneck, from practical access to enantioenriched precursors to the mechanistic origin of stereochemical loss during cyclic allene generation.

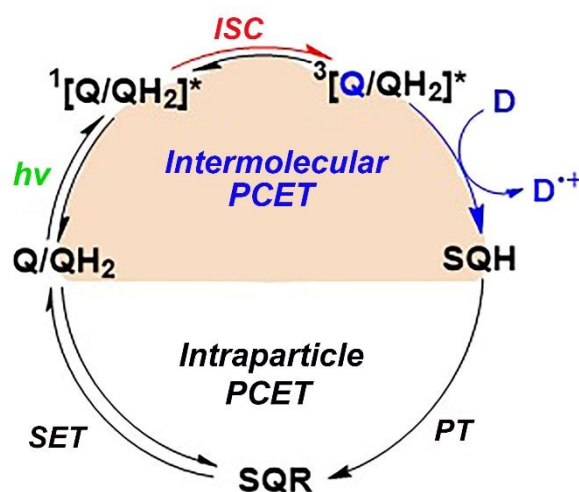
Photoredox catalytic performance of iodinated polydopamine

Chanyoung Jung, Jungkyu K. Lee*

Department of Chemistry, Kyungpook National University

E-mail: jkl@knu.ac.kr

Polydopamine (PDA), a synthetic melanin analogue, is widely studied for its adhesion, photoreactivity, and biocompatibility. In this study, we investigate the structure-performance relationships of PDA derivatives, using post-polymerization functionalization to modulate their photophysical properties. We incorporated heavy halogen atoms into PDA to leverage the heavy-atom effect, enhancing intersystem crossing and tuning photoredox catalytic behavior under light irradiation. Notably, iodine-functionalized PDA demonstrated significantly improved catalytic efficiency, which was attributed to increased intersystem crossing facilitated by spin-orbit coupling. The photoredox catalytic performances of PDA derivatives were evaluated by radical polymerization, which provides efficient observation of catalytic activity. For kinetic study, NMR spectroscopy was employed to monitor the monomer conversion depending on irradiation time. We also conducted comprehensive characterizations using spectroscopic and electrochemical techniques to understand the mechanism of the photoredox catalysis. For example, the rate constant of photoinduced electron transfer (PET), one of the key parameters for the photoredox catalysis, can be determined by the Gibbs free energy of PET based on Marcus theory. We could determine the Gibbs free energy value using time-resolved photoluminescence at 77 K and linear sweep voltammetry. These findings provide insights into the role of heavy atoms in melanin-inspired systems and offer a foundation for designing advanced functional materials. Our work demonstrates the potential of iodine-modified PDA for photocatalysis, energy conversion, and biocompatible systems, while highlighting the utility of post-polymerization functionalization in tuning organic photoreactive materials.



Photoredox catalytic activity:

PDA < I₂PDA < I₄PDA < I₈PDA < I₁₅PDA

----->
increasing iodine content

Discovery of a Novel Methyl Isocyanate (MIC) Surrogate

Yumi Kim, Soo yeon Kim and Hee Nam Lim*

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*E-mail: heenam@yu.ac.kr

Methyl isocyanate (MIC) is a representative reagent for N-methyl carbamoylation that has been widely utilized in the industrial synthesis of pesticides and biologically active molecules. However, the academic application of MIC has been limited by safety concerns associated with its toxicity, volatility, and handling. In this study, we investigated a novel MIC surrogate. The target reagent was simply prepared from an oxime. The new reagent exhibited broad carbamoylation reactivity toward a wide range of nucleophiles, including N-, O-, S-, P-, and C-nucleophiles. Furthermore, this methodology enabled the efficient synthesis of diverse pharmaceutically relevant N-containing heterocycles through sequential carbamoylation and intramolecular cyclization reactions.

Pd-Catalyzed [3 + 2] Cycloaddition/Ring-Expansion Strategy for the Synthesis of Medium-Sized *N*-Heterocycles

Seoung-Mi Choi, Hong Kwon Lee and Ju Hyun Kim*

Department of Chemistry, Dongguk University

E-mail: juhyunkim@dgu.edu.kr

We present a Pd-catalyzed cycloaddition strategy for the efficient synthesis of structurally diverse *N*-heterocycles. This methodology facilitates the rapid construction of five-membered *N*-heterocyclic frameworks from cyclic sulfamidate imines. Notably, the resulting cycloadducts, which possess an acidic C–H bond, serve as valuable synthetic intermediates for base-promoted ring expansion, producing synthetically challenging medium-sized cyclic sulfamides. Overall, this work establishes an efficient and unified platform for accessing medium-sized *N*-heterocycles by combining Pd-catalyzed cycloaddition with a ring-expansion strategy.^[1]

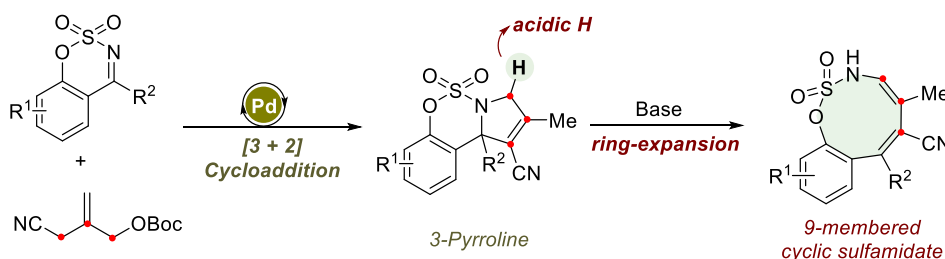


Figure 1 Synthesis of medium sized *N*-heterocycles via Pd-catalyzed cycloaddition & ring expansion reaction

Reference

[1] Choi, S.-M.; Park, J.-U.; Kim, J. H. *Adv. Sci.* **2025**, *12*, e13904.

Total Synthesis and Biological Evaluation of Exiguamines

Seungju Noh, Jisook Park, Yeehwan Kim, Chulbom Lee*

Department of Chemistry, Seoul National University, Seoul 08826, Republic of Korea

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Exiguamines are a class of indoloquinone alkaloids first isolated in 2006 from the marine sponge *Neopetrosia exigua*.^[1] These hexacyclic compounds, obtained as racemic mixtures, exhibit nanomolar inhibitory activity against indoleamine 2,3-dioxygenase (IDO), a key enzyme in tryptophan metabolism and immune regulation. While the first total syntheses of exiguamines A and B were reported by the Trauner group,^{[2],[3]} significant synthetic challenges remain—particularly in achieving regioselective oxidation during indoloquinone formation and effecting C–C bond formation between the catechol and quinone moieties.

Leveraging a quinone redox-aromatization strategy, we initiated a synthetic campaign aimed at efficient total syntheses of the racemic natural products as well as their enantiomers and diastereomers for biological evaluation. This poster outlines a modular synthetic route wherein a revised sequence of bond constructions at the pyran core—utilizing both Michael addition and Claisen rearrangement—enables an improved synthesis of exiguamine A and access to enantiopure exiguamine B. Furthermore, by fine-tuning the prefunctionalization of the Michael acceptor, we have also synthesized several unnatural exiguamine isomers.

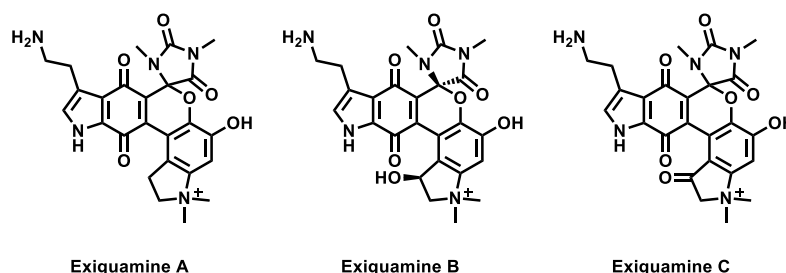


Figure 1. Structures of Natural Exiguamines.

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Asymmetric Dearomative Spirocyclization of Phenols Based on Silver-Pyridone Bifunctional Catalyst

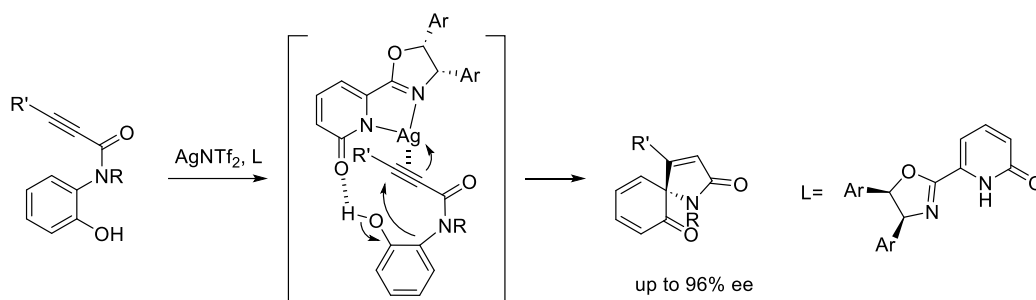
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Rational design of new ligands is central to advancing asymmetric transition metal catalysis. In this context, we have developed an extension of the metal-ligand cooperation (MLC) concept of 2-pyridonates, which originate from [Fe]-hydrogenase in methanogenic archaea. Inspired by the recent advances in Pd-catalyzed C-H activation with pyridone-based ligands, we recognized the broader potential of pyridone ligands to act as Brønsted bases in asymmetric catalysis.¹

We envisioned that Ag-pyridonate complexes may activate alkynes and phenol nucleophiles through a concerted and synergistic fashion. This concept is demonstrated by our recent development of a pyridone-based Ag(I) catalyst for the dearomative spirocyclization of phenols, achieving enantioselectivity of up to 96% ee.



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Study on Chemoselective Synthesis of *N,O*- or *O,O*-Acetals via Palladium-Catalyzed Addition of Nucleosides into Alkoxyallenes and Its Application to Sustainable Functional Polymers

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Nucleoside-functionalized polymers have attracted significant attention in smart materials due to their molecular recognition and complementary hydrogen-bonding capabilities. However, the precise functionalization of nucleoside derivatives remains challenging due to the competing nucleophilicity between the imide NH and ribose OH groups. Recently, we discovered that the selective synthesis of either *N,O*-acetals, through the NH group of imides, or *O,O*-acetals, through the hydroxyl group of ribose, can be achieved depending on the presence or absence of a mild Brønsted acid. We are currently conducting studies to elucidate the reaction mechanism underlying this selectivity.

By incorporating this highly selective methodology into the previously reported chemically recyclable 7-membered cyclic acetal monomer platform¹, we are developing a novel uridine-containing 7-membered *O,O*-acetal monomer for sustainable, degradable, and recyclable polymers. The 7-membered acetal backbone designed for ring-closing metathesis depolymerization (RCMD) ensures efficient acid-degradability and complete monomer recovery, while the pendant nucleosides enable the reversible modulation of polymer properties via complementary base pairing.

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Harnessing π -Interactions in Boronate Catalysis for Site-Selective Acylation with Highly Reactive Electrophiles

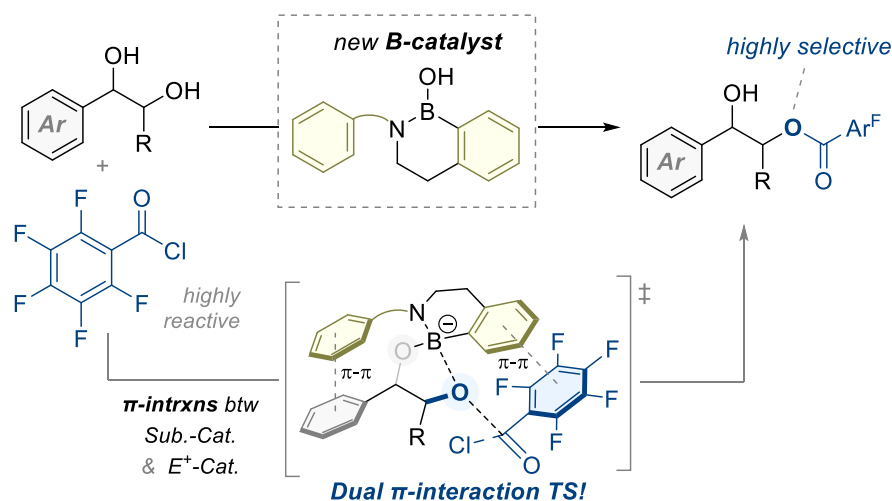
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Abstract

The use of highly reactive electrophiles often presents a fundamental challenge in selective catalysis, as enhanced reactivity can erode catalyst control and compromise discrimination between closely related functional groups. This challenge has limited the use of highly activated acylating reagents such as pentafluorobenzoyl chloride in site-selective alcohol protection. To address this challenge, we sought to enhance the selectivity profile of borinic acid catalysts, which are well known for vicinal diol activation, by incorporating a π -interaction-based molecular recognition element into the catalyst framework. This strategy led to the development of an aryl-substituted borinic acid catalyst that enables highly regioselective acylation of unsymmetrical aryl-substituted *vicinal* diols. Mechanistic studies support a cyclic borinate intermediate, in which favorable aryl-aryl π -interactions selectively disfavor benzylic oxygen acylation, thereby promoting site-selective functionalization at the competing aliphatic alcohol. Experimental and computational studies further reveal that these non-covalent interactions indeed play a decisive role in controlling regioselectivity. This work demonstrates how molecular recognition can be integrated into boron catalyst design to overcome selectivity limitations associated with highly reactive electrophiles and establishes aryl-aryl recognition as a powerful strategy for site-selective functionalization in oxygen-rich compounds.



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Rational Design of Photoredox-Switchable Chalcogen Bonding for High-Contrast Solar Windows

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We are preparing high-efficient dye-sensitized solar cell using sigma-hole effect. Sigma-hole effect occurs in 14~17 Group periodic table. It involves a region of positive electrostatic potential on the extension of one of the covalent bonds to the atom. Previously, halogen atoms, especially Iodine which has high intensity of sigma-hole shows high regeneration efficiency[1]. But it has limitations of low overall efficiency and stability. So we use chalcogen atoms to enhance stability and dye regeneration efficiency. Chalcogen atom has closed-ring structure that shows high stability and also, it possess two sigma-hole so it can attract negative-charged iodide electrolyte better than single-hole halogen atom (Fig. 1a). Diphenyl amine which possess Chalcogen atom is used as donor and Diketopyrrolopyrrole(DPP) which shows high extinction coefficient[2] is used as Core unit (Fig. 1b). Sigma-hole effect is shown by ¹H-NMR peak shift and Raman spectroscopy. Enhancement of Dye regeneration efficiency is proved by transient absorption spectra.

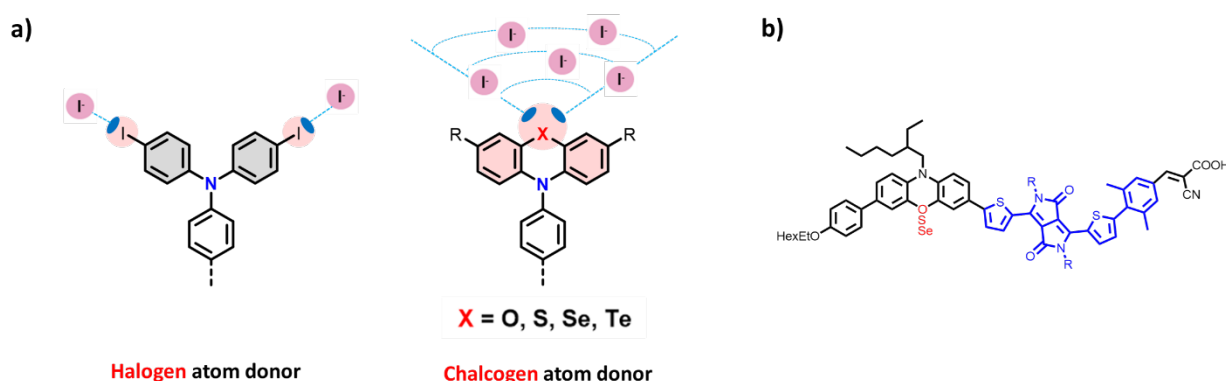


Figure 1 a) Halogen atom & Chalcogen atom donor interaction with iodide. b) Proposed dye full structure.

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NHC–CDC Ester Dication: Formation and Exploration of Unique Photoreactivity

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Radicals have attracted considerable attention as key reactive intermediates in synthetic chemistry, and visible-light-induced radical generation offers a mild and sustainable approach for synthetic transformations. Despite these advantages, conventional photocatalytic systems often suffer from issues associated with residual metal contaminants. Accordingly, significant efforts have been directed toward the development of photocatalyst-free systems capable of directly promoting homolytic cleavage upon visible-light absorption, thereby providing efficient strategies for radical generation.

Carbodicarbenes (CDCs), featuring two lone pairs at the central carbon atom, have emerged as powerful ligands owing to their exceptional donor properties, enabling the stabilization of high oxidation state main-group elements and applications in multimetallic systems and catalysis. Nevertheless, previously reported synthetic routes to CDCs often require harsh reaction conditions or multistep procedures, which have limited their broader applicability [1,2].

In this presentation, we will introduce the formation of an NHC–CDC ester dication derived from NHCs and (COCl)₂, and demonstrate that blue LEDs irradiation under photocatalyst-free conditions induces homolytic C–O bond cleavage, enabling the generation of a transient CDC radical cation intermediate. Given the limitations of conventional CDC synthetic methods, this strategy is expected to provide a valuable photochemical platform for accessing CDC-based molecular architectures.

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Molecular Probes toward Blood-Based Alzheimer's Disease Detection

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Blood-based biomarkers are becoming increasingly important for minimally invasive Alzheimer's disease diagnostics. However, most current plasma assays rely on antibody-based platforms and provide mainly static concentration-based readouts, leaving dynamic molecular states associated with early protein aggregation less explored¹. Here, we developed a series of small-molecule fluorescent probes, **N1–N3**, rationally designed through stepwise π -bridge elongation within a donor– π –acceptor scaffold. This molecular design strategy was used to tune solvation sensitivity and motion-gated emission, allowing subtle aggregation-associated microenvironmental changes to be converted into optical signals².

During in vitro A β ₄₂ fibrillogenesis, the probes showed distinct time-dependent fluorescence responses. Among them, **N2** exhibited a pronounced response during the oligomer-enriched early phase and showed strong affinity toward oligomeric assemblies. We further established a time-resolved plasma assay in which synthetic A β ₄₂ and **N2** were introduced into individual plasma samples, and fluorescence trajectories were monitored over time. Instead of relying on a single endpoint measurement, this assay extracts dynamic kinetic features and a fluorescence turn-on index, $\log(I/I_0)$, reflecting plasma-dependent modulation of aggregation-associated molecular states.

In clinical plasma samples, $\log(I/I_0)$ showed gradual attenuation across the Alzheimer's disease continuum and correlated with amyloid-PET SUVR and plasma biomarkers such as p-tau217 and GFAP. These results suggest that disease-related plasma environments can reshape probe-accessible aggregation trajectories, potentially through immune- and lipid-associated matrix effects. Overall, this work presents a small-molecule design principle for blood-compatible fluorescent probes and proposes a dynamic plasma assay that complements existing biomarker-based workflows for Alzheimer's disease research and early detection.

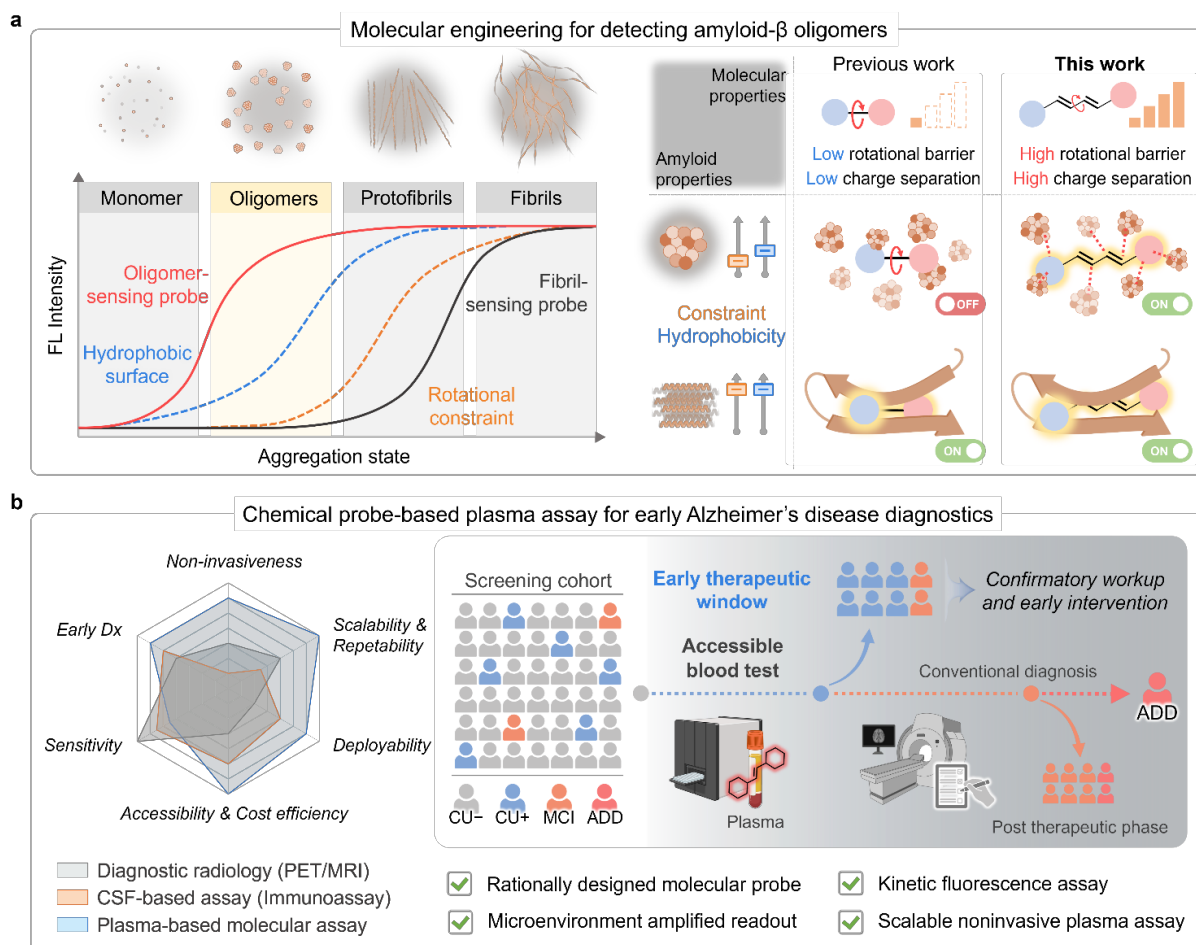


Figure 1. Molecular engineering strategy and assay concept. **a** π -extended probe scaffold for detecting amyloid- β ($A\beta$) oligomer- and fibril-associated microenvironments. π -extension increases the effective rotational barrier to intramolecular twisting and strengthens intramolecular charge transfer (ICT) character, yielding microenvironment-dependent fluorescence responses. **b** Conceptual illustration of a minimally invasive and scalable molecular plasma assay designed to complement diagnostic imaging and established biofluid immunoassays within an early therapeutic window. The panel (b) was created with BioRender.com.

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Calcium-Triggered Helix Metamorphosis of a Cyclopentane-Based Oligoamide Foldamer

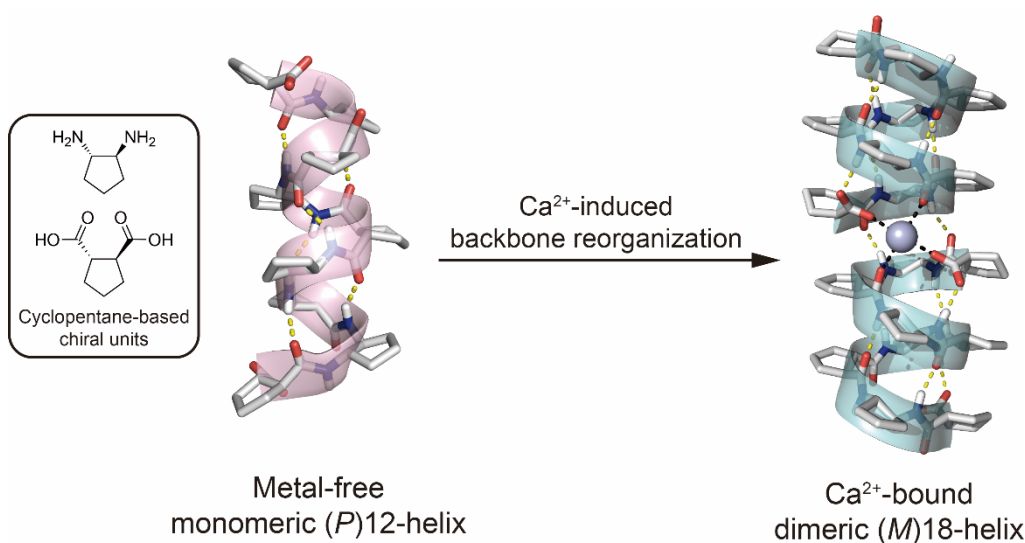
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Large-scale structural switching in rigid chiral foldamers remains difficult because the structural constraints that stabilize their preferred folds also resist global reorganization.¹ Here, we show that Ca^{2+} coordination reprograms a cyclopentane-based oligoamide foldamer from a stable monomeric (*P*)12-helix^{2,3} into a dimeric, helicity-inverted (*M*)18-helix. CD spectroscopy, NMR, and hydrogen–deuterium exchange experiments indicate that Ca^{2+} binding substantially reorganizes the original hydrogen-bonding network. Low-temperature NMR, Job plot, and DOSY analyses support the formation of a discrete 2:1 foldamer/ Ca^{2+} complex, while NOESY analysis and single-crystal X-ray diffraction support the assignment of the Ca^{2+} -bound state as a dimeric (*M*)18-helix. The transformation changes helix handedness, helix type, repeat pattern, and molecular dimensions, rather than merely inverting screw sense. These results show that Ca^{2+} coordination can redirect a rigid chiral foldamer into an otherwise disfavored helical state, providing a rare abiotic counterpart to the large-scale fold switching observed in metamorphic proteins.⁴



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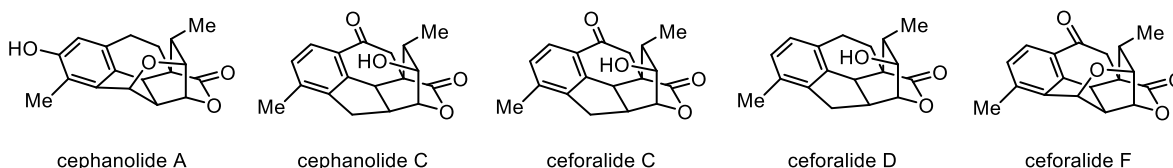
Studies toward the Total Synthesis of Cephanolide and Ceforalide via Asymmetric 2-Pyrone Intramolecular Diels-Alder Reaction

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Cephanolides and ceforalides are benzenoid cephalotane-type norditerpenoid natural products primarily isolated from the genus *Cephalotaxus*. They feature a characteristic fused 5-6-5 tricyclic ring system and a bridged lactone moiety. These compounds exhibit significant biological activities; notably, inhibiting cancer cell growth and blocking viral replication. Structurally, the natural products cephanolide and ceforalide are built on highly fused polycyclic lactone frameworks, making them challenging yet attractive targets in the synthetic organic chemistry community.

In this study, we developed a new synthetic route that provides straightforward access to cephanolides and ceforalides from 3,5-dibromo-2-pyrone. The key steps include a site-selective Sonogashira cross-coupling and a tandem dehydration/asymmetric intramolecular Diels-Alder reaction. We present our progress toward the total synthesis of a selected set of natural products in the cephanolide and ceforalide classes.



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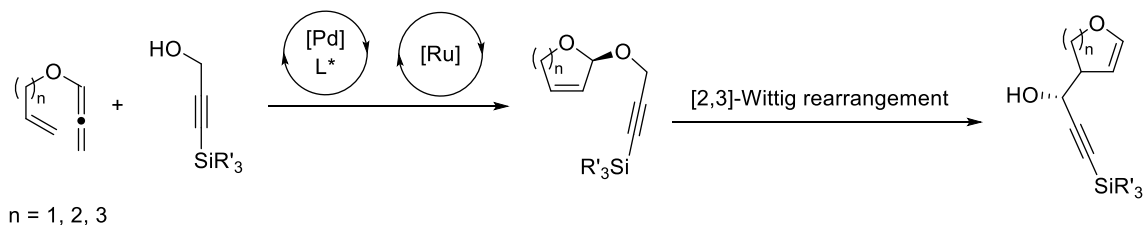
Synthesis of 3-*C*-branched furanose glycals via [2,3]-Wittig rearrangement of chiral acetals

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Sigmatropic rearrangements provide reliable and efficient tools for constructing carbon–carbon bonds in complex molecules¹, among which the [2,3]-Wittig rearrangement stands out as a highly versatile process with broad utility in organic synthesis². Herein, we report a synthesis of 3-*C*-branched furanose glycals via [2,3]-Wittig rearrangement of chiral acetals. This method enables the effective transfer of acetal chirality while simultaneously generating an additional stereocenter, with excellent yield and stereoselectivity. The scope of the reaction has been expanded to include the formation of quaternary carbon stereogenic centers, demonstrating its value as a powerful strategy for the synthesis of challenging molecules. Notably, this approach afforded exclusively the [2,3]-shift products, with no [1,2]-Wittig rearrangement observed.



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구두발표

***N*-Acyl Benzisothiazolinones (*N*-Acyl BITs): A Versatile and Robust Scaffold for Acyl Transfer**

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The formation of amide bonds continues to be a crucial process in both synthetic organic chemistry and chemical biology. Recently, our group introduced *N*-acyl benzisothiazolinones (*N*-acyl BITs) as a highly stable, new-generation class of acylating agents that facilitate efficient amidation under mild, aqueous-compatible conditions. Unlike the traditional N–S bond cleavage commonly observed in benzisothiazolinone derivatives, these *N*-acyl BITs proceed via direct acyl–nitrogen bond activation. This unique reactivity allows for rapid, additive-free acyl transfer to various amines.

N-acyl BITs display an extensive substrate scope, reacting smoothly with primary, secondary, and aromatic amines across diverse organic and mixed aqueous media. Crucially, they exhibit significantly greater hydrolytic stability than traditional activated esters, including *N*-hydroxysuccinimide (NHS) esters, proving their exceptional robustness in water-containing environments. To demonstrate the practical utility of this scaffold, we synthesized a BIT–biotin derivative and successfully applied it to the *N*-terminal biotinylation of peptides in mixed solvent systems.

Expanding upon this methodology, our current research aims to integrate the *N*-acyl BIT platform into polymer-supported systems. Initial findings suggest that the distinctive stability and reactivity of the BIT moiety are well-preserved even within macromolecular frameworks, opening new avenues for efficient amide bond formation and the development of functional materials.

In summary, our studies highlight *N*-acyl BITs as a highly effective and versatile platform for acyl transfer, with significant potential for advancing both synthetic chemistry and biomolecular modifications.

Ir(triNHC) catalyzed upcycling of Poly(butylene terephthalate) into biodegradable polymer
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Abstract

With the increasing generation of discarded plastic waste, plastic pollution has become a critical environmental issue. Consequently, considerable research attention has been directed toward the upcycling of waste plastics into value-added chemicals and materials. In this study, we synthesized an Ir(triNHC) catalyst and employed it for the selective conversion of waste poly(butylene terephthalate) (PBT) into γ -hydroxybutyric acid (GHB) and succinic acid (SA). To gain mechanistic insight into the catalytic system, kinetic studies were performed to determine the reaction orders with respect to the reactants and catalyst, thereby elucidating their roles in the dehydrogenative transformation. The obtained GHB and SA were further utilized as monomers for the synthesis of biodegradable polymers, including poly(4-hydroxybutyrate) (P4HB) and poly(butylene succinate-co-terephthalate) (PBST). Overall, this work demonstrates a sustainable upcycling strategy that converts waste PBT into biodegradable polymers, while the kinetic investigation highlights the distinctive features of the Ir(triNHC)-catalyzed dehydrogenation process.

Visible-Light-Mediated Synthesis of Tetrahydroquinolines via Electron Donor–Acceptor Complexes

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Abstract

Tetrahydroquinolines are privileged scaffolds with diverse applications in chemical biology and synthesis, and the development of efficient and sustainable methods for their synthesis remains an important objective.¹ Traditional approaches to tetrahydroquinoline synthesis have largely relied on cyclization strategies, including the Povarov reaction. However, these methods generally require electron-rich alkenes and acid-catalyzed conditions, which can limit substrate scope and selectivity. Radical-based approaches offer a complementary solution to these limitations by enabling the generation of α -aminoalkyl radicals from imines, thereby providing access to polarity-reversed reactivity distinct from conventional imine chemistry.² However, the direct generation of α -aminoalkyl radicals from imines remains challenging, because imines possess highly negative reduction potentials.³ Herein, we report an electron donor–acceptor complex-based radical strategy for the synthesis of tetrahydroquinolines from imine and styrene derivatives. This approach affords tetrahydroquinoline products with high *syn*-selectivity without external oxidants, reductants or photocatalysts.

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Ligand-Controlled Catalytic Hydroarylation of Allenes for Regioselective and Enantioselective Synthesis of Arylated Alkenes

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Hydroarylation of allenes is an attractive and atom-economical method for the synthesis of arylated alkenes; however, achieving regioselective control remains a significant challenge because allenes possess multiple reactive sites within their cumulated diene framework. Ligand-controlled catalysis provides an effective solution by enabling selective access to distinct hydroarylation pathways through catalyst design. In this study, we developed a ligand-controlled regiodivergent hydroarylation of allenes based on Cu-catalyzed hydroalumination with diisobutylaluminum hydride (DIBAL-H), followed by Pd-catalyzed cross-coupling with aryl bromides in a single vessel. The Cu-catalyzed hydroalumination generated allylaluminum intermediates that subsequently underwent Pd-catalyzed coupling.

The regioselectivity of the coupling step was dictated by the ligand employed: XPhos promoted γ -selective arylation, whereas a Josiphos-type ligand enabled highly α -selective arylation. In addition, direct Pd-catalyzed hydroarylation of allenes provided complementary β -selective arylation, affording multisubstituted alkenes and enantioenriched aryl-substituted alkenes. These results demonstrate that α -, β -, and γ -arylated alkenes can be selectively accessed from common allene substrates through ligand-controlled catalysis, highlighting the powerful role of ligand design in controlling both regioselectivity and stereoselectivity.

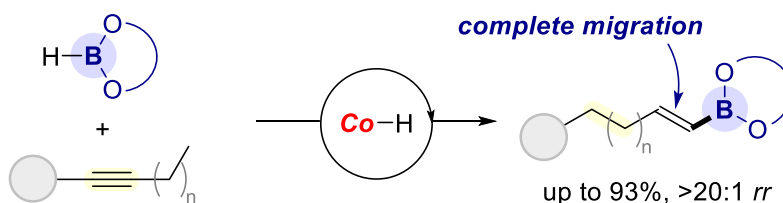
Cobalt-Catalyzed Alkyne Migratory Hydroboration

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Migratory functionalization offers an efficient strategy for building functionalized hydrocarbon frameworks, yet complete migration of an alkyne π -bond remains challenging. In this presentation, we report a cobalt-catalyzed remote hydroborylation of internal alkynes that enables π -bond migration over distances of up to eight carbon atoms, followed by regioselective borylation to afford β -(*E*)-alkenylboronates under mild conditions. Mechanistic studies support full alkyne migration prior to borylation, while experimental and computational results reveal that the electronic and steric properties of the borane govern regioselectivity through key transition-state interactions.



Towards a Formal Synthesis of Sinensilactam A

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Abstract

A structurally unique meroterpenoid, Sinensilactam A, isolated from the medicinal fungus *Ganoderma sinensis*, has attracted synthetic interest owing to its densely functionalized bicyclic 2H-pyrrolo[2,1-b][1,3]oxazin-6(7H)-one core featuring two contiguous syn-bridgehead carbon quaternary stereocenters. To address these synthetic challenges, we developed a strategy based on a divinylcyclopropane Cope rearrangement–1,5-silyl migration–Claisen rearrangement sequence. This cascade process enables rapid assembly of the central carbon framework of Sinensilactam A from a straightforwardly prepared precursor while establishing the contiguous syn-adjacent quaternary stereocenters in a highly stereocontrolled manner. The stereospecificity of this cascade sequence arises from a well-defined transition-state geometry that dictates the relative stereochemical outcome of the two adjacent bridgehead carbons. Current efforts are focused on oxidation of a terminal protected alcohol to the corresponding carboxylic acid derivative, followed by a Friedel–Crafts acylation to introduce the electron-rich aryl moiety. The accumulated synthetic efforts are hereby presented alongside with unfruitful prior approaches which have been unyielding yet informative regarding the reactivity and conformation of the natural product skeleton. Successful completion of these transformations is expected to provide a key aldehyde intermediate previously utilized in reported synthetic studies, thereby constituting a formal synthesis of Sinensilactam A.

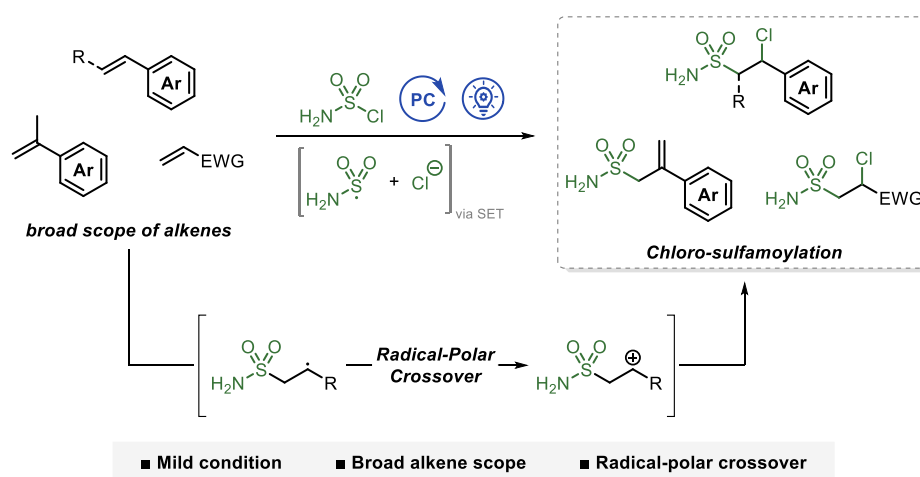
Photoredox-Catalyzed Chlorosulfamoylation of Alkenes Using Unsubstituted Sulfamoyl Chloride

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Sulfonamide motifs are well established as privileged structures in medicinal chemistry, as they modulate physicochemical and biological properties and serve as bioisosteres of acyl and carboxyl groups.^[1] Traditionally, sulfonamides are synthesized via nucleophilic substitution between sulfonyl chlorides and amines. More recently, photoredox catalysis has enabled the generation of sulfonyl-derived radicals, providing efficient strategies for alkene functionalization under mild conditions.^[2] Despite these advances, the direct incorporation of a free sulfamoyl (NH₂-SO₂-) group remains underexplored. Meanwhile, chlorine substituents play an important role in medicinal chemistry, serving not only as versatile synthetic handles but also as key elements for tuning structure–activity relationships.^[3] Herein, we report a photoredox-catalyzed chlorosulfamoylation of alkenes enabling the simultaneous installation of a free sulfamoyl group and a chloride under mild conditions. This transformation provides direct access to β-chlorosulfonamide derivatives, delivering versatile intermediates for further functionalization and potential applications in pharmaceutical scaffold development.



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Stereoconservative Nucleophilic Substitution

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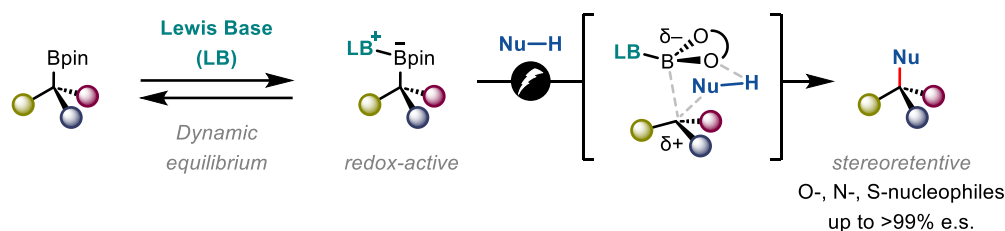
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Nucleophilic substitution is the most fundamental transformation for constructing sp^3 -hybridized carbon–heteroatom ($C(sp^3)$ –Het) bonds. However, classical S_N1 and S_N2 pathways impose a trade-off between reactivity and stereocontrol due to their intrinsic mechanistic constraints. To address such challenges, we herein report an electro-oxidative, stereoconservative nucleophilic substitution platform to forge asymmetric $C(sp^3)$ –Het bonds at hindered reaction centers. Combining the dual role of a chiral organoboron compound with controlled anodic oxidation, this synergistic design ensures broad compatibility with a wide range of O-, N-, and S-centered nucleophiles. Experimental studies and computational calculations elucidate that a precisely directed attack of a heteroatom nucleophile onto a transiently generated radical center serves as the key stereodefining step.



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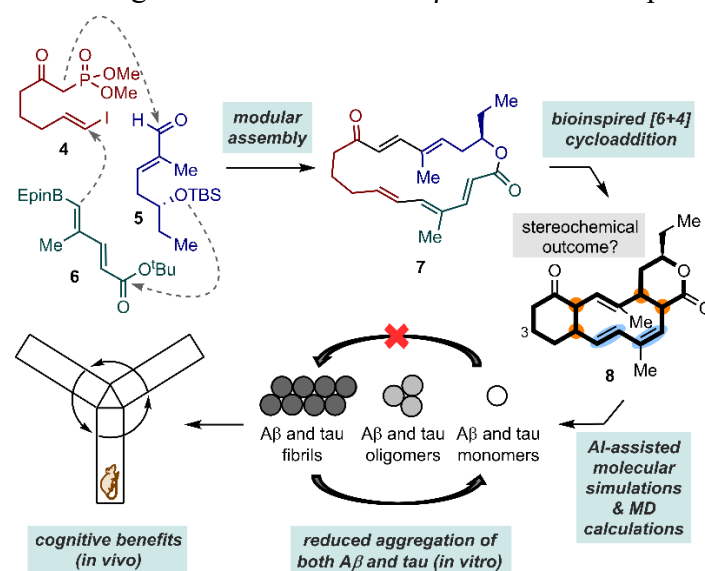
Synthesis of 3-desoxycollinoketone B and its ability to reduce Alzheimer-associated misfolded proteins

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Collinolactone, featuring a 7/10/6 tricyclic core, has been proposed to be biosynthesized via a transannular [6 + 4] cycloaddition reaction. Besides its intriguing architecture, collinolactone holds pharmaceutical promises due to its ability to disrupt amyloid- β ($A\beta$) and tau aggregation, which are specifically found as disease culprits in the brains of Alzheimer's disease (AD) patients and are key targets in current drug discovery efforts. However, challenges associated with its acquisition from a natural source and limited pharmacokinetic properties have hampered its further studies. Herein, we report the design, synthesis, and biological evaluation of 3-desoxycollinoketone B, a collinolactone derivative with improved pharmacokinetics for AD treatment. A stereoselective transannular [6 + 4] cycloaddition efficiently constructs the tricyclic core, allowing its scalable synthesis. AI-assisted binding prediction and simulations not only indicate superior binding of 3-desoxycollinoketone B to $A\beta$ and tau aggregates to collinolactone, but also suggest a mechanistic basis for fibril destabilization. In vitro studies confirm its inhibition and dissociation of $A\beta$ and tau fibrils, while in vivo experiments in AD mouse models show substantial amelioration of cognitive functions and $A\beta$ /tau-associated pathology.



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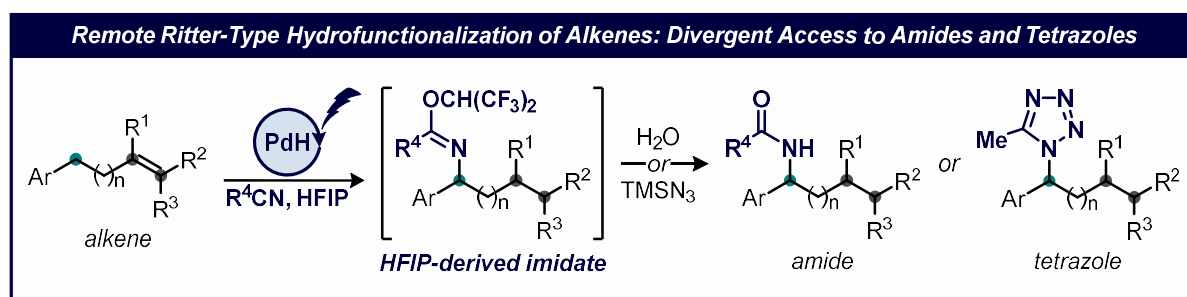
PdH-Catalyzed Remote Ritter-Type Hydrofunctionalization of Alkenes via Electrochemical Oxidation

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The formation of C(sp³)-N bonds is a fundamental transformation in organic synthesis and plays an important role in the preparation of pharmaceuticals and functional materials. Among the various approaches, Ritter-type hydrofunctionalization has emerged as an efficient strategy for the introduction of nitrogen-containing functional groups into alkenes.^{1,2} However, existing Ritter-type hydrofunctionalization remains limited to functionalization at the original alkene position, with the resulting products largely restricted to amides. Herein, we report an electrooxidative palladium-hydride catalysis that enables remote and divergent Ritter-type hydrofunctionalization of alkenes.³ In this transformation, a distal nitrilium intermediate generated via Pd-H chain-walking is intercepted by HFIP to furnish a HFIP-derived imidate, which serves as a branching intermediate for telescoped hydroamidation and hydrotetrazolization. Mechanistic studies reveal the crucial role of HFIP in promoting palladium-hydride formation and further reveal the role of electrooxidation in governing product formation.



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Visible-Light-Mediated Alkylation of Imines Using Alcohol as A Radical Precursor

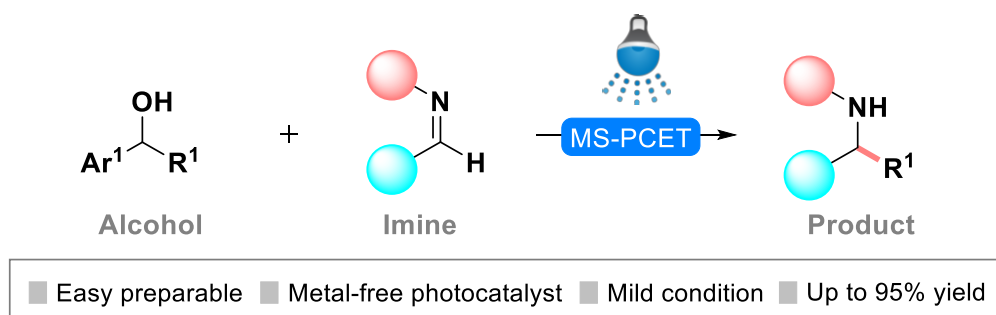
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Imines are important intermediates in the synthesis of amine scaffolds. The amines are widely used as feedstock chemicals and building blocks for synthesis of biologically active compounds in agrochemicals and pharmaceuticals.¹ Traditionally, amines are synthesized by imine addition reactions using organometallics as nucleophiles.² In the past decades, visible-light photoredox catalyzed imine addition reactions have been developed to prepare amines using various radical precursors, such as alkyl trifluoroborates^{3a} and silicates^{3b}. In this work, we report a new strategy for the synthesis of amines using benzyl alcohol as alkyl radical precursors via the PCET mechanism under photoredox catalysis. A wide range of alkyl amines were obtained in good to excellent yields. This strategy was also conducted under mild conditions and using a metal-free photocatalyst.



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Acetals Beyond Protecting Groups for Diverse C–C Bond Formation via C–O Bond Activation

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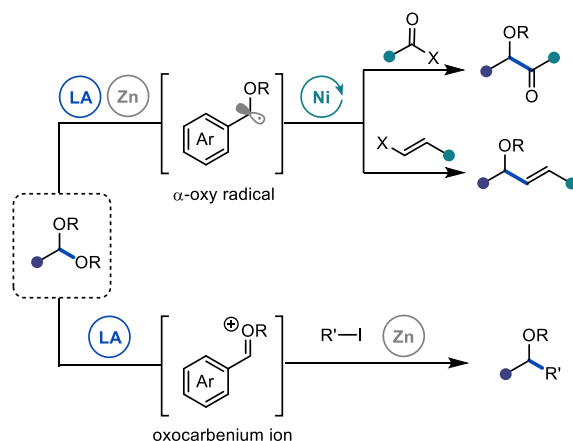
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Acetals are common protecting groups for aldehydes; however, their direct C–O bond activation for C–C bond formation remains relatively underexplored. If this potential could be unlocked, employing acetals as building blocks for direct C–C bond formation could provide a step-economical approach to accessing α -substituted ethers from aldehydes by obviating the steps of deprotection and alkylation. Access to α -substituted ethers via Ni-catalyzed C(sp³)–C(sp²) bond formation can be achieved by leveraging α -oxy radicals generated from acetals through single-electron transfer (SET). The use of anhydrides as coupling partners provides complementary reactivity to classical cross-benzoin condensation, while reactions with vinyl triflates enable access to ether derivatives analogous to classical NHK reaction products. Furthermore, acetals extend beyond C(sp³)–C(sp²) bond formation to direct C–O bond activation strategies for transition-metal-free coupling with unactivated alkyl electrophiles. In this strategy, Zn promotes the in-situ activation of alkyl iodides rather than serving as a reductant, enabling Reformatsky-type reactivity and providing direct access to alkyl-substituted ethers from readily available acetal precursors. These studies demonstrate that acetals enable diverse bond-forming strategies beyond their traditional role as protecting groups.

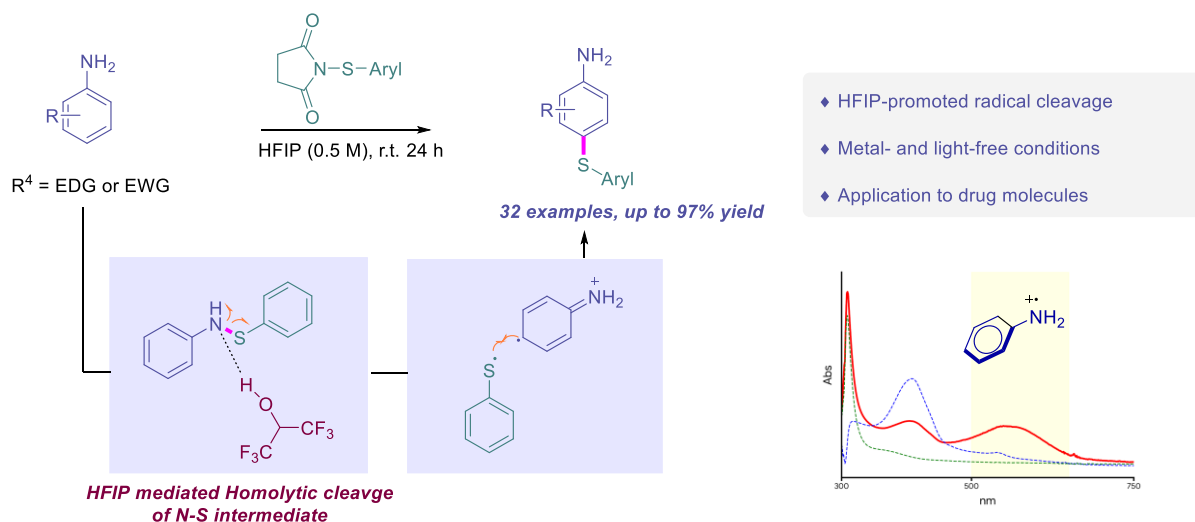


Hydrogen Bond-Promoted C4-Selective Sulfenylation of Anilines via N-S Bond Homolysis

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The site-selective C4 sulfenylation of aromatic amines is crucial for pharmaceutical development, yet conventional methods often rely on transition-metal catalysts or harsh oxidants. Herein, an HFIP (hexafluoroisopropylalcohol)-promoted, metal-free and external oxidant-free protocol for highly C4-selective sulfenylation of anilines (and selected heteroarenes) under ambient conditions is reported using *N*-thiosuccinimide (NTS). Mechanistic investigations, including Hammett analysis, reveal a unique polarized radical pathway involving the in situ formation of a transient sulfenamide intermediate. The strong hydrogen-bonding network of HFIP promotes the homolytic N-S bond cleavage, generating a sulfenyl radical and an HFIP-stabilized aniline radical cation without external stimuli. Furthermore, this methodology exhibits broad functional group tolerance and has been successfully applied to the late-stage functionalization of complex active pharmaceutical ingredients (APIs), including imatinib and dasatinib, demonstrating its high synthetic utility in drug diversification.



구두 발표

Sustainable CO₂-based polymers for adhesive applications

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The continuous increase in atmospheric carbon dioxide (CO₂) emissions from fossil fuel consumption and industrial processes is one of the primary drivers of global warming and climate change. Consequently, the development of effective strategies for CO₂ capture and utilization has become an important research focus for achieving more sustainable chemical processes and reducing environmental impact.

In this work, maleic anhydride and propylene oxide were employed as monomers in a highly efficient Zn-gallate-catalyzed terpolymerization system to synthesize a series of CO₂-based terpolymers with catalytic activities reaching up to 2.2 kg/g-cat. By controlling the monomer feeding sequence, polymers with random and block-type structures were successfully obtained. In addition, polymer topology was adjusted using linear diols and branched polyols as chain-transfer agents. The influence of carbonate content on the properties of the resulting polymers was also systematically investigated.

Furthermore, the synthesized polymers exhibited promising adhesive properties. Several samples showed lap shear strengths exceeding 4 MPa, demonstrating superior performance compared to conventional commercial adhesives.

One Precursor, Two Pathways: Metal-Free Ionic and Radical Hydrosulfonylation Using Pyrimidylsulfones

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Sulfones are important structural motifs in pharmaceuticals, agrochemicals, and functional materials owing to their unique physicochemical properties and biological activities, creating a continuing demand for efficient and versatile synthetic methods for their preparation. We report a condition-responsive hydrosulfonylation platform in which a single pyrimidylsulfone precursor provides access to either ionic or radical reactivity toward electron-deficient alkenes under distinct reaction conditions. Under ionic conditions, treatment of pyrimidylsulfones^[1] with DMAP generates a sulfinate ion pair *in situ*, which undergoes Michael-type addition to furnish the corresponding sulfones with mild, metal-free conditions. A photocatalytic protocol employing eosin Y was also developed to overcome the limitations in substrate scope and reaction efficiency observed under the ionic condition. Under visible-light irradiation, pyrimidylsulfone can undergo photoredox activation to produce sulfonyl radicals, which participate in Giese-type hydrosulfonylation^[2] and provide improved yields and broader substrate compatibility. Mechanistic studies suggest that both reaction pathways can originate from a common sulfinate ion-pair intermediate, with subsequent ionic addition or photoredox activation governing the reaction outcome. These results demonstrate that pyrimidylsulfones can serve as versatile sulfonyl donors for both ionic and radical hydrosulfonylation.

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Photocatalytic furan-to-pyrrole conversion

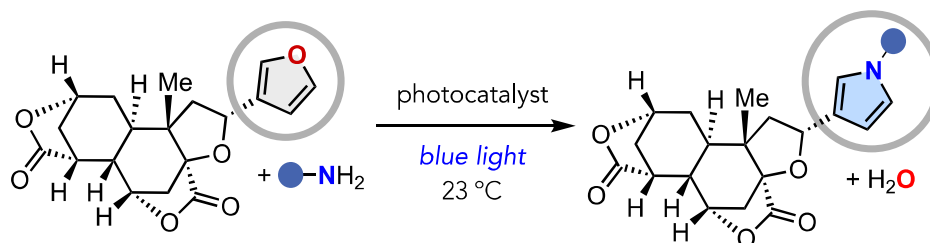
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A single atom constituting a bioactive molecule can profoundly impact the compound's properties and efficacy. Thus, the drug discovery process merits a synthetic assessment of the single-atom effect; however, it is often discouraged as substituting a single atom requires laborious multi-step procedures or impractical, harsh conditions. Meeting the contemporary demand, we present a single-atom exchange strategy that directly converts a furan into pyrrole by replacing its oxygen atom with a nitrogen atom. Given the mild photocatalytic condition, the protocol offers a broad substrate scope with excellent selectivity in a single step. Late-stage functionalizations were successfully conducted on pharmaceuticals and natural products, further corroborating the synthetic integrity of the method and unlocking streamlined access to otherwise unattainable heterocyclic analogs. Mechanistic studies suggest that one-electron oxidized furan undergoes a Umpolung C-N bond formation, which triggers a cascade of proton and electron transfers and facilitates ring-opening. Consecutive condensation achieves ring closure, producing the pyrrole analog and completing the redox-neutral catalytic cycle.



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Acid-Mediated Double Cyclizations for L-Region Expansion of PAHs: Divergent Mechanistic Pathways via Dehydrative Cyclization

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Polycyclic Aromatic Hydrocarbons (PAHs) have emerged as highly useful organic optoelectronic materials, as their structural variations—such as size, shape, and edge topologies—significantly influence their chemical and physical properties. Traditional syntheses of PAHs have predominantly relied on multistep approaches or the conventional Scholl reaction. However, methods for L-region annulation remain limited to date. In this work, we reveal unprecedented synthetic access to the elongation of conjugated fused aromatic rings, leveraging Lewis and Brønsted acid-promoted cascade intramolecular cyclization. Our primary strategy focused on designing an appropriate synthetic precursor for the periphery extension of benzene. The 1-(4-methoxyphenyl)-4-(2-(naphthalen-2-yl)phenyl)but-2-yne-1,4-diol model substrate demonstrated the feasibility of this approach. The reaction proceeded under mild conditions without the need for metal catalysts or additional additives, successfully yielding an irregular PAH. This facile has set the stage for the direct transformation of readily available precursors to novel, structurally complex PAHs.

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구두 발표

Molecular-level reconstruction of electron–hole recombination from isolated radical ions

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In organic electroluminescence, charge recombination generates emissive excited states, yet the underlying molecular processes remain elusive. At the molecular level, electrical excitation generates charged species through electron and hole injection (1). Among these, open-shell radical ions are plausible intermediates responsible for charge recombination and excited-state formation (2). Indeed, recent studies on multi-resonance thermally activated delayed fluorescence (MR-TADF) emitters and phosphorescent iridium complexes have highlighted the importance of radical-ion intermediates during device operation (3, 4). However, these reactive species exist only transiently under electrically biased operating conditions, making direct molecular-level investigation exceptionally challenging. We report the isolation of both radical cation and anion of an organoboryl emitter, employing them as chemically addressable models of charged species. Structural and spectroscopic analyses reveal that both radical ions are persistent open-shell species with delocalized spin density and distinct excited-state dynamics. Controlled annihilation of the isolated radical-ion pair generates intense emission matching the photoluminescence of the neutral emitter. Marcus theory–based calculations indicate that emissive recombination is kinetically preferred over a non-radiative electron transfer pathway. These findings establish isolated radical ions as experimentally accessible intermediates and enable a molecular-level reconstruction of electron–hole recombination.

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Water-Compatible SuFEx-Active Linchpins for On-DNA Conjugation

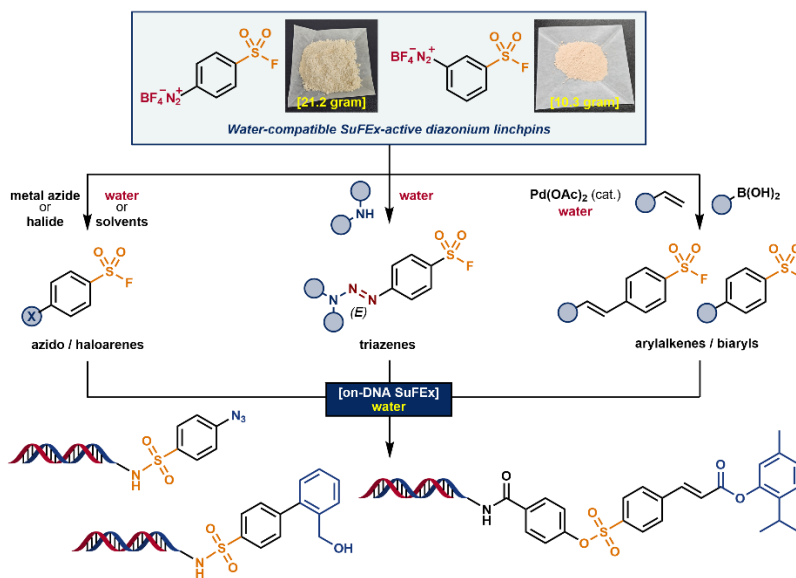
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Over the past decade, sulfur–fluorine exchange (SuFEx) click chemistry has emerged as a prominent synthetic tool, owing to its exceptional selectivity and robustness toward other synthetic transformations. Consequently, it has established itself as a preferred strategy for constructing functional sulfur-based covalent linkages. [1] However, expanding the chemical space of sulfonyl fluoride-bearing compounds has remained challenging due to their synthetic complexity and the toxicity of reagents. The linchpin approaches involving small molecules are considered methods for incorporating functional groups; however, they are still rarely reported. In this presentation, we demonstrate new bench-stable, SuFEx active linchpins that can be converted to biaryl- or styryl sulfonyl fluorides via practical Pd(II)-catalyzed coupling reactions in biocompatible aqueous conditions. Moreover, the linchpin can be applied to access aryl triazenes via a rapid N–N bond-forming reaction in weakly basic aqueous solution. The attached sulfonyl fluoride can be converted to sulfonate esters and sulfonamides under non-toxic nucleophilic substitution conditions, thereby demonstrating the carbon/sulfur bis-electrophile strategy. This concept was further extended to biorelevant molecules, including human hormone derivatives, monoterpenoids, and antidepressants. Moreover, the linchpin strategy was successfully applied to on-DNA bioconjugation and holds strong potential for DNA-encoded library (DEL) construction.[2]



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Photoelectrocatalytic chemical transformation in dye-sensitized photoelectrochemical cells for lignin valorization

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Selective cleavage of C–C/C–O bonds in lignin offers a viable strategy for the sustainable production of petroleum-derived chemicals and fuels. While *N*-oxyl-mediated dye-sensitized photoelectrochemical cells (DSPECs) exhibit high selectivity for the cleavage of lignin under ambient conditions, a fundamental understanding of the thermodynamic, kinetic and structural factors governing catalytic efficiency remains elusive. Conventional electrocatalytic studies predominantly focused on alcohol oxidation and assuming a sufficient supply of oxoammonium (oxidized *N*-oxyl radical). In contrast, photoelectrocatalytic DSPECs, the generation of oxoammonium can be precisely controlled through energy levels of the photosensitizer and the *N*-oxyl radical, which can become an important factor governing the overall reaction. Herein, we investigated the interplay between thermodynamic driving force for oxoammonium generation (ΔG_{NO^+}), substrate oxidation driving force (ΔG_{ox}) and its steric effect in *N*-oxyl radical-mediated oxidative bond cleavage reaction (*N*-OBCR) of phenolic LMC *via* DSPECs. Transient photocurrent and GC-MS analysis for product revealed that a higher ΔG_{NO^+} facilitate oxoammonium generation, promoting selectivity and yield. Moreover, it reveals that steric effects rather than oxidation driving force are the primary determinant of selective oxidative bond cleavage in lignin model compound. Thus, a maximum yield of 62% for the cleaved products, 2,6-dimethoxy-1,4-benzoquinone (DMBQ), was achieved with the highest ΔG_{NO^+} DSPEC using **T-Cbz** photosensitizer. Moreover, identical DSPEC could depolymerize organosolv lignin, obtaining 22 wt% of monomers containing DMBQ. These findings provide a valuable guideline for designing efficient photoelectrocatalytic *N*-OBCR systems, emphasizing that optimizing oxoammonium generation and steric accessibility are critical for sustainable lignin valorization.

DMSO-Ligated Pd(II)-Catalyzed Diastereoselective Oxidative Cyclization of Unactivated Alkenes with Allyl Alcohols for the Synthesis of Oxolanes Derivatives

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Oxygen heterocycles are the second most common type of heterocycles that appear as structural components of U.S. Food and Drug Administration (FDA) approved pharmaceuticals. Analysis of our database of drugs approved through 2017 reveals 311 distinct pharmaceuticals containing at least one oxygen heterocycle. The majority (89%) of the oxygen heterocycles are nonaromatic; 95% of aromatic are 5-membered rings.¹ The intramolecular cyclization of palladium π -olefin and π -alkyne complexes is a powerful method for the construction of heterocycles. The intramolecular cyclization of palladium π -olefin and π -alkyne complexes is a powerful method for the construction of heterocycles.² However, this synthetic strategy is largely restricted to intramolecular reactions and does not provide a clear rationale for the observed selectivity between five- and six-membered ring products. Given the significant regioselectivity challenges associated with endo-trig, endo-dig, exo-dig, and exo-trig cyclization pathways, a cyclization process that enables selective carbon–heteroatom bond formation despite multiple potential modes of substrate reactivity represents an attractive strategy.³ In this project, we sought to overcome the limitations of the existing reaction conditions by employing an intermolecular approach, thereby developing a reaction platform capable of controlling chemo- and diastereoselectivity. In previous work, Hosokawa group shows stereoselective synthesis and catalytic amount of oxidation protocols using vinyl ethers and allyl alcohols to generate 5-membered heterocycle product. Moreover, Yamamoto group utilized allylic alcohols bearing allylic carbonate, demonstrating an effective synthesis of oxolane derivatives with good yield and moderate diastereoselectivity. We report herein that palladium-catalyzed oxidative cyclization of alkenes with allylic alcohols, enabling the diastereoselective synthesis of oxolane derivatives under aerobic conditions.

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Regiodivergent Cu-Catalyzed Double Protoborylation of 1,3-Enynes and *trans*-Monoborylation of (*Z*)-Aryl-1,3-Enynes

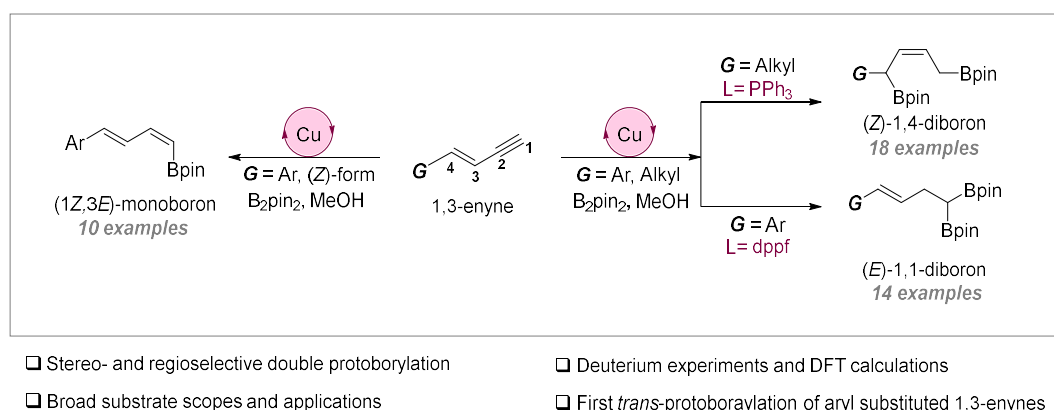
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The capability for orthogonal C–B bond functionalization has established organodiboron compounds as indispensable building blocks in organic synthesis. Methods for preparing vicinal and geminal diboron compounds from simple olefins are well-established; however, capturing "skipped diboron" motifs still represents a formidable challenge in modern synthesis. This scarcity arises because these frameworks demand the use of conjugated precursors, which, as pioneered by the Song group, present a severe hurdle: the second borylation cannot proceed without first breaking the restrictive "conjugate tie."¹⁻³ We envisioned that this fundamental limitation could be overcome using a 1,3-enyne platform by strategically altering the connectivity sequence of the alkene and alkyne segments. Guided by this design, we herein disclose a copper-catalyzed protocol with high stereo- and regioselectivity, enabling 1,1- and 1,4-diborylation as well as the *trans*-monoborylation of (*Z*)-aryl-1,3-enynes.

Optimization studies revealed that the ligand dictates the regioselectivity: PPh₃ afforded (*Z*)-1,4-diboron compounds, while dppf yielded (*E*)-1,1-diboron compounds. Consequently, the substrate scope was completed with 18 examples for (*Z*)-1,4-diborons and 14 examples for (*E*)-1,1-diborons. Furthermore, we report the first example of a Cu-catalyzed *trans*-protoborylation of (*Z*)-aryl-substituted 1,3-enynes to synthesize (1*Z*,3*E*)-1-boryl-4-aryldienes with complete stereoselectivity. To investigate these selective outcomes, DFT calculations were conducted. For alkyl systems, the second LCu–Bpin insertion occurs at the C4 position instead of C1 to minimize steric hindrance with the first Bpin moiety. Additionally, the Zimmerman TS with MeOH arranges to minimize steric repulsion, yielding the (*Z*)-form. Conversely, for aryl systems, the steric repulsion between the Bpin groups is alleviated by van der Waals interactions between the substrate's aryl group and the phenyl rings of the ligand, directing the reaction toward the 1,1-diborons. The synthetic utility of this catalytic system was underscored by the successful gram-scale synthesis of a natural antifouling agent and the diverse functionalization of the 1,1-diborylated products, demonstrating its broad versatility and robustness.



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Visible Light Induced EDA-Mediated Metal-Free Decarboxylative Heck Coupling towards Sustainable Stilbene Synthesis.

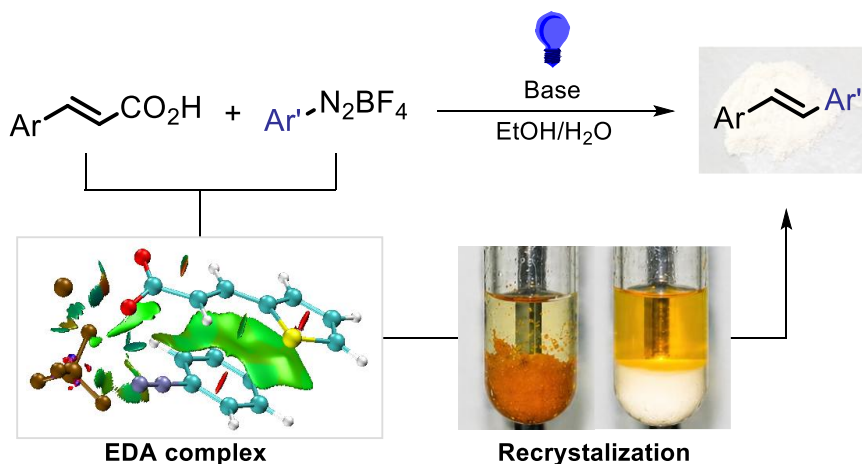
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Abstract:

Developing synthetic methods with no external additives remains a central objective in sustainable organic synthesis. In this work, we report a visible-light-induced, metal-free protocol for the synthesis of trans-stilbene derivatives via a mild decarboxylative Heck-type coupling of cinnamic acids, including heterocyclic variants, with diazo substrates in a green solvent. The methodology demonstrates broad substrate scope and affords the desired products in good to excellent yields under mild reaction conditions. Mechanistic investigations revealed the formation of an electron donor–acceptor (EDA) complex which upon visible-light irradiation, underwent single-electron transfer (SET) to generate an aryl radical that initiated coupling process. DFT studies were found to be consistent with experimental observations, revealing that the resulting EDA complex exhibits broad visible-light absorption characteristics, which rationalize the successful product formation under irradiation with different wavelengths of visible light. The sustainability of the protocol was further enhanced through recrystallization using the reaction solvent, minimizing additional solvent consumption. Overall, the use of readily available cinnamic acid and aniline derivatives, combined with metal and photosensitizer free conditions and a green solvent system, highlights a practical, efficient, and environmentally benign strategy for the synthesis of trans-stilbene derivatives.



- Metal & Photosensitiser free Environmentally benign protocol

Hydroxamate-Mediated Self-Assembly of Fe³⁺-BTH Complexes for Material-Independent Film Formation and Single-Cell Nanoencapsulation

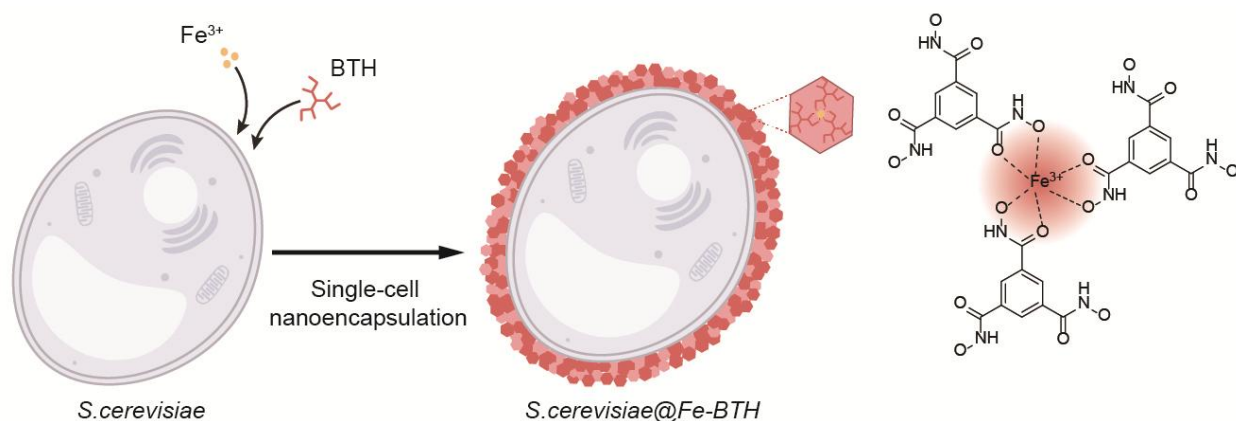
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ABSTRACT

Metal-organic complexes (MOCs) offer a flexible route to surface functionalization because of their tunable chemistry. Conventional material-independent coatings based on catechol or pyrogallol ligands face practical limitations, particularly in terms of chemical modification. This constraint has driven interest in alternative organic ligand platforms for material-independent coating. Inspired by siderophores, which employ the robust hydroxamate-iron coordination to scavenge iron in nature, here we demonstrate the supramolecular self-assembly of ferric ions with benzene-1,3,5-trihydroxamic acid (BTH) to form Fe-BTH MOC films that adhere to any substrate, including PTFE. The siderophore-inspired Fe-BTH system is biocompatible, enabling encapsulation of living cells with minimal impact on viability. We extended the Fe-BTH system to develop a stimuli-responsive double-shell encapsulation strategy. Together, these results position Fe-BTH MOCs as a versatile platform for surface modification and bioengineering.



Photoactive and Photoluminescent First-Row Transition Metal Complexes

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Keywords: Photoluminescence • first-row transition metal complexes • Earth-abundant metals
• excited state dynamics • coordination chemistry

Luminescent molecular complexes have been extensively explored in applications such as dye-sensitized solar cells and photoinduced electron or energy transfer catalysis, due to their distinctive photochemical and photophysical properties. To date, molecular luminophores based on precious metals such as platinum (Pt), iridium (Ir), and ruthenium (Ru) have dominated this field. Their strong spin–orbit coupling (SOC) enables efficient intersystem crossing (ISC), leading to long-lived excited states at room temperature and excellent performance in light-driven processes. Despite their robust performance, the use of noble metal-based luminophores poses sustainability concerns due to their high cost and limited natural abundance. In light of these concerns, first-row transition metals have emerged as promising alternatives, given their substantially higher abundance in the Earth's crust.^[1–4] Herein, we present a novel tridentate ligand design that induces strong room temperature photoluminescence upon coordination with 3d transition metals. This study highlights a new class of first-row transition metal-based luminophores and provides insight into their photophysical behavior and excited-state dynamics.

Acknowledgements

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Trifluoroethoxy Vinyl Sulfoxide: A Versatile Reagent for Divergent Synthesis

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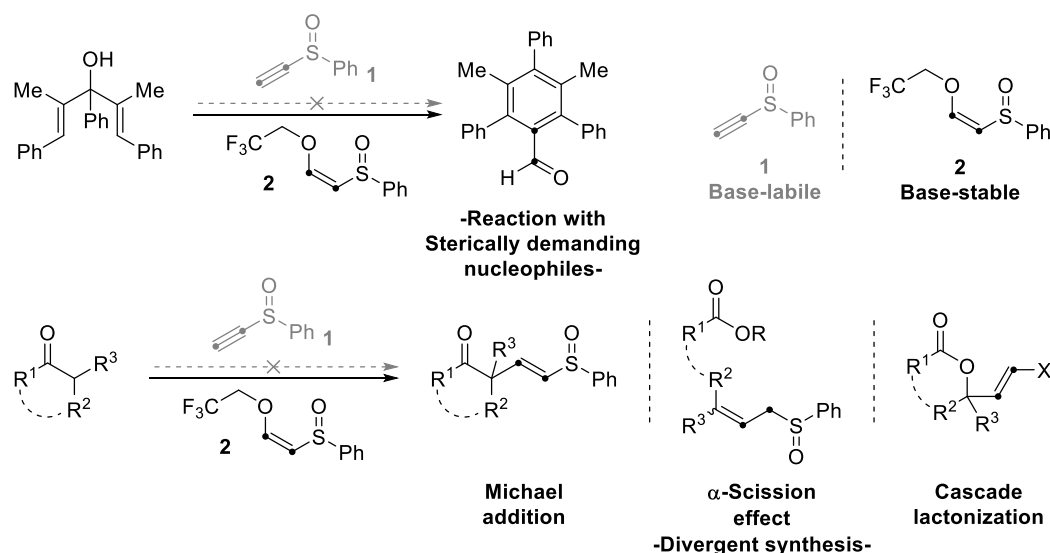
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The development of a versatile reagent platform enabling access to structurally diverse scaffolds has been an attractive area of research in synthetic organic chemistry. Ethynyl sulfoxide **1** has demonstrated broad synthetic utility, enabling the synthesis of α -hydroxy vinyl ketones and oxacyclic scaffolds. Furthermore, our group has recently utilized sulfoxide **1** for synthesizing highly substituted benzenes, pyridines, and cyclopentenes via cascade reaction pathways. Despite its synthetic utility, the intrinsic instability of sulfoxide **1** under basic conditions restricts its compatibility with sterically hindered nucleophiles.

To address this limitation, (2,2,2-trifluoroethoxy)vinyl sulfoxide **2** was developed to enable the efficient addition of these challenging nucleophiles (Scheme 1). Broad nucleophilic compatibility was established, affording high yields across a broad range of sterically diverse nucleophiles. Notably, reactions with sterically hindered nucleophiles revealed novel reaction pathways, enabling condition-controlled divergent synthesis. This presentation will highlight our comprehensive efforts toward reagent design, mechanistic understanding, and the diverse synthetic applications of sulfoxide **2**.



Scheme 1. (2,2,2-Trifluoroethoxy)vinyl sulfoxide **2** as a versatile reagent platform for diverse synthetic transformations

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Discovery and Synthesis of Flueggeacosines D–F and Securingine J

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Sunkyun Han^{1,2}

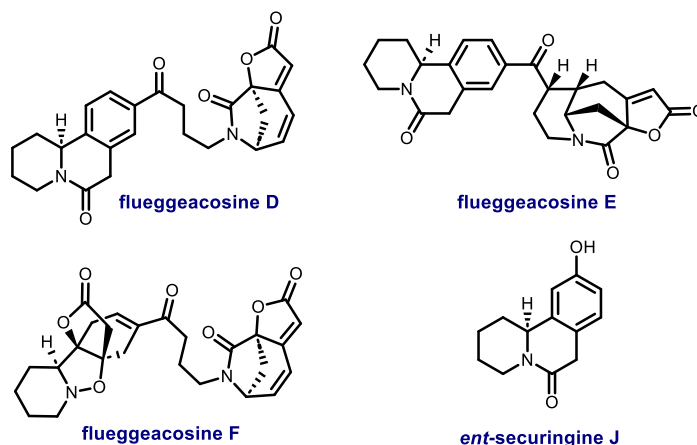
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Securinega alkaloids^{1,2} constitute a structurally diverse class of natural products with intriguing architectures and biological activities. Herein, we report the discovery of four new securinega alkaloids, flueggeacosines D–F and securingine J, from *Flueggea suffruticosa*. Flueggeacosines D and E possess dimeric frameworks incorporating a benzoquinolizidine motif derived from allosecurinine backbone. A concise synthetic strategy combining TBADT-catalyzed radical hydroacylation and Mo(CO)₆-mediated reductive rearrangement enables efficient access to these complex alkaloids. Our synthetic approach also realizes a synthesis-based natural product anticipation predicting and confirming the existence of flueggeacosine F and securingine J in *F. suffruticosa*. Furthermore, oxidative rearrangements of flueggeacosine A furnish flueggeacosines D and F, supporting a plausible biosynthetic linkage. These findings³ establish a unified route to oxidized dimeric securinega alkaloids and demonstrate the synergy of synthesis and biosynthetic reasoning in natural product discovery.



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Keywords: Biomimetic synthesis, Natural product synthesis, Structure elucidation.

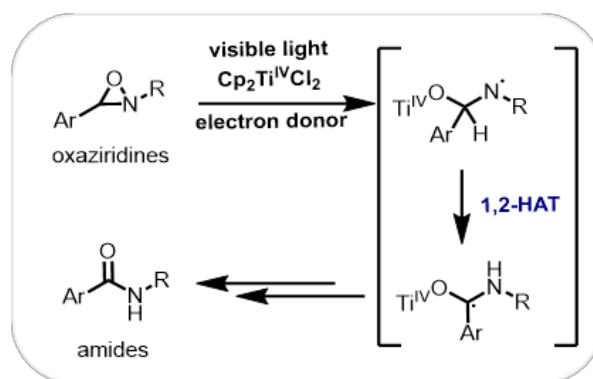
Cp₂TiCl₂-Catalyzed Photochemical Rearrangement of Oxaziridines to Amides

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We report a novel and efficient strategy for amide synthesis via Cp₂TiCl₂-catalyzed photochemical rearrangement of oxaziridines. In this system, titanocene dichloride (Cp₂TiCl₂) acts as a dual-role catalyst, serving as both a visible-light photocatalyst and an inner-sphere reductant. This approach offers a sustainable alternative to conventional systems by utilizing an earth-abundant, cost-effective titanium source. The protocol exhibits broad substrate scope, delivering good to excellent yields across various aryl- and alkyl-substituted oxaziridines. Mechanistic studies, supported by control experiments and DFT calculations, suggest a radical chain pathway involving in situ generated Ti(III) species and a key 1,2-hydrogen atom transfer (1,2-HAT) step. This work highlights the potential of Cp₂TiCl₂ as an environmentally benign catalyst. Ongoing studies focus on base effects, spectroscopic detection of intermediates, and expanding the method to more challenging substrates, including N-tosyl oxaziridines.



Scheme 1. Cp₂TiCl₂-Catalyzed Radical Rearrangement of Oxaziridines

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Identification of 5,7-Dihydro-6H-pyrrolo[2,3-d]pyrimidin-6-one Derivatives as ENPP1 Inhibitors for STING Pathway-Mediated Immunotherapy

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Immune checkpoint inhibitors (ICIs) have demonstrated significant clinical benefit across multiple cancer types. However, a considerable proportion of patients show only a limited therapeutic response due to the immunosuppressive tumor microenvironment (TME). Ectonucleotide pyrophosphatase/phosphodiesterase 1 (ENPP1), a negative regulator of the cGAS–STING pathway, hydrolyzes extracellular 2'3'-cGAMP, thereby suppressing antitumor immune responses, making it an attractive target for cancer immunotherapy.

To identify novel ENPP1 inhibitors, we designed and synthesized a series of 5,7-dihydro-6H-pyrrolo[2,3-d]pyrimidin-6-one derivatives. Optimization of this scaffold led to the identification of a potent ENPP1 inhibitor with an IC₅₀ value of 14.68 nM and approximately 410-fold and 10-fold selectivity over ENPP2 and ENPP3, respectively. The lead inhibitor prevented cGAMP degradation and enhanced STING–TBK1–IRF3 signaling, resulting in increased IFN- β secretion and interferon-stimulated gene expression. In addition, it exhibited favorable ADMET properties and significant antitumor efficacy in 4T1 and CT26 syngeneic mouse models, particularly in combination with immune checkpoint blockade.

These findings highlight the potential of ENPP1 inhibition to enhance STING-mediated antitumor immunity and improve the therapeutic efficacy of cancer immunotherapy

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[Oral Presentation]

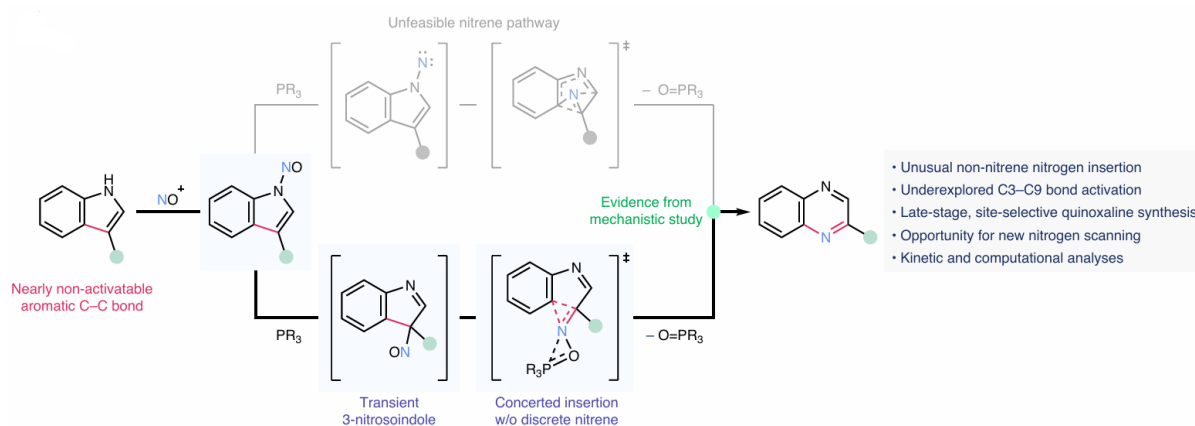
Regio-orthogonal single N-atom insertion into indoles via NO translocation

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The atom-by-atom manipulation of the core molecular framework has come into reality recently. In particular, the late-stage diversification of robust aza-arenes such as indole has been at the centre of research activity because of its importance in biological and pharmaceutical studies. The previous single-atom modifications of indoles were made possible through the insertion of a reactive nitrene species into the enamine-like C2–C3 bond, resulting in the incorporation of a new atom at the 3-position. Here we discovered an alternative reaction mode, in which the *N*-nitroso group underwent a sequential intramolecular translocation and deoxygenative rearrangement to afford regiochemically orthogonal 1,4-diazines that had been lacking in skeletal editing. This activation of the nearly inert aromatic C3–C9 bond was applicable to various indoles including bio-relevant molecules to furnish quinoxalines, a class of underexplored pharmacophores. The combined experimental and computational studies revealed the reaction mechanism for the unique selectivity pattern.



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Nickel-Catalyzed Skeletal Editing of Benzothiazoles into Quinolines

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Quinoline derivatives occupy a central position in medicinal chemistry and materials science due to their widespread presence in bioactive compounds and functional molecules. Despite their importance, the efficient synthesis of densely functionalized and diverse quinoline scaffolds remains a longstanding challenge in organic synthesis. Herein, we report a nickel-catalyzed skeletal editing strategy for sulfur-containing heteroaromatics using alkynes, which directly affords quinoline scaffolds under mild conditions. Notably, the reaction demonstrates excellent regioselectivity with unsymmetrical alkynes, enabling efficient synthesis of 3,4-disubstituted quinoline derivatives.

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Nickel-Catalyzed Alkynyl–Alkyl Cross-Electrophile Coupling via Ligand-Controlled Sequential Activation

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Cross-electrophile coupling (XEC) has emerged as a powerful strategy for C–C bond formation by enabling the direct coupling of two electrophilic partners while avoiding the use of sensitive nucleophilic reagents. Although substantial progress has been made in aryl–alkyl bond formation, alkynyl–alkyl bond formation remains underdeveloped, primarily because of chemoselectivity challenges arising from the intrinsic reactivity mismatch between alkynyl electrophiles and alkyl electrophiles.¹

Herein, we report a nickel-catalyzed alkynyl–alkyl cross-electrophile coupling enabled by a tridentate ligand that governs the sequence of electrophile activation.² This reaction exhibits high chemoselectivity and broad substrate scope, accommodating unactivated primary, secondary, and even sterically hindered tertiary alkyl electrophiles, thereby addressing a long-standing challenge in C(sp³)–C(sp) bond formation. Notably, this method represents the first reductive coupling of unactivated tertiary alkyl electrophiles with alkynyl partners.

Mechanistic studies reveal that this approach proceeds through an unusual ligand-controlled sequential activation pathway, in which the nickel catalyst engages the alkyl electrophile prior to oxidative addition of the alkynyl partner. This “alkyl-first” activation pathway is distinct from conventional XEC strategies that rely on rate matching of electrophile reactivity and effectively suppresses undesired homocoupling. Overall, this study demonstrates how ligand control over the activation sequence can unlock challenging alkynyl–alkyl bond formation from unactivated alkyl electrophiles.

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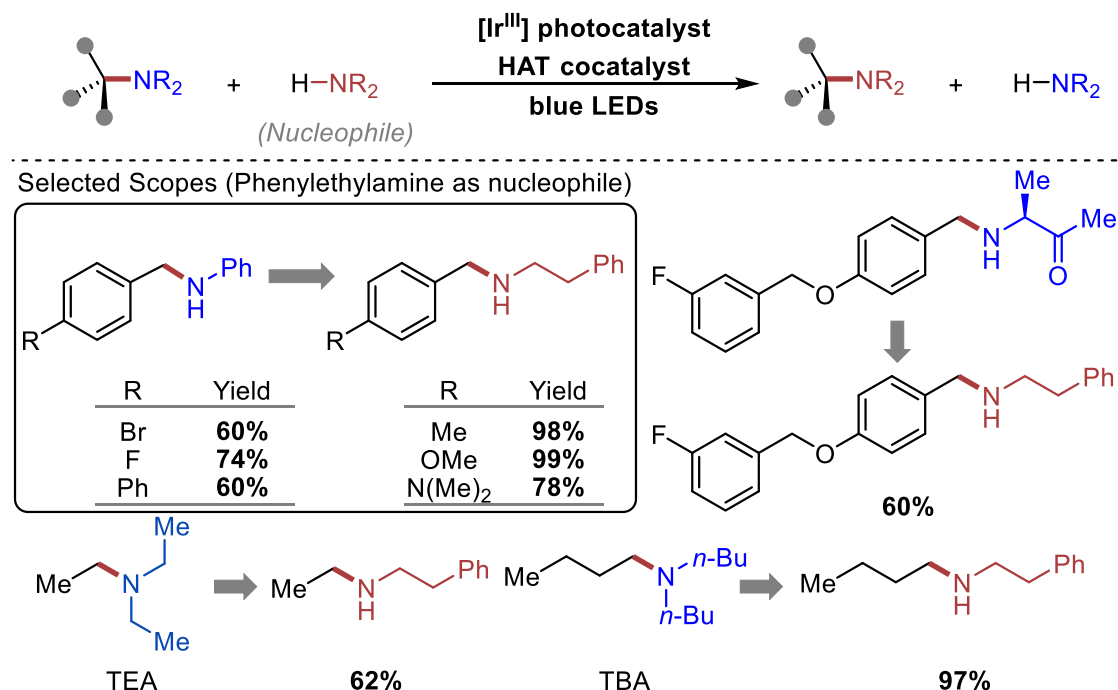
Light-Driven Deaminative Nucleophilic Substitution *via* C(sp³)-N bond Cleavage: Nucleophilic Transamination of Alkyl Amines

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Herein, we report a photoredox-enabled catalytic transamination strategy that enables direct amine-to-amine interconversion without prefunctionalization. The reaction proceeds *via* a polarity inversion pathway, in which one amine is converted into an electrophilic iminium intermediate that couples with a second amine nucleophile. The method exhibits broad scope across benzylic, unactivated, and tertiary amines. Mechanistic studies support the intermediacy of α -amino radical and iminium species, and reveal that selectivity is governed by two key principles: reaction directionality is controlled by relative nucleophilicity, while site-selectivity in C(sp³)-N bond cleavage is dictated by electronic activation or steric accessibility. This work establishes a general platform for the direct functionalization of native amines, with potential applications in the late-stage modification of complex and bioactive molecules.



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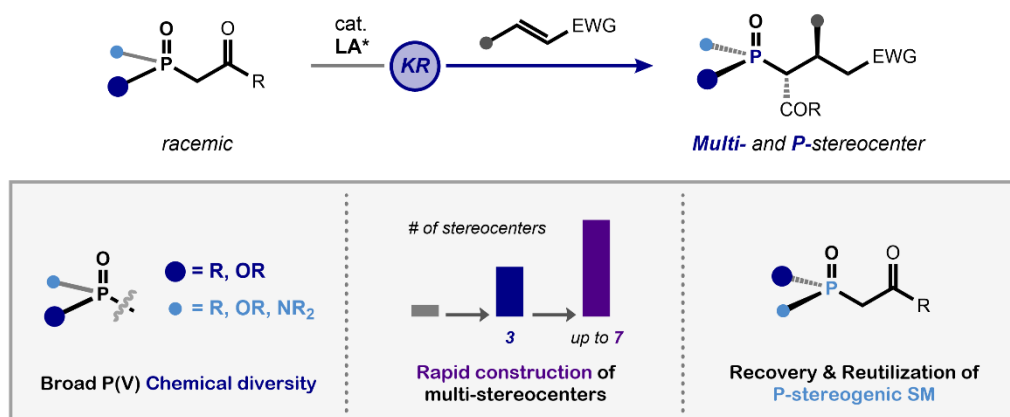
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Catalytic Multiple Stereocontrol of Phosphorus and Carbon Stereogenic Centers in a Single Bond-Forming Operation

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Synthetic chemists strive to maximize stereochemical complexity while minimizing synthetic protocols. Although catalytic methods for controlling carbon stereochemistry are now well established, achieving comparable stereocontrol in phosphorus-containing molecules remains an unresolved challenge, particularly in the simultaneous construction of multiple stereogenic centers including a P-stereogenic center. Herein, we report a Lewis acid-catalyzed asymmetric conjugate addition platform that enables the highly enantio- and diastereoselective assembly of P-stereogenic molecules bearing three contiguous stereocenters through a single C–C bond-forming step. The strategy operates through catalytic kinetic resolution of racemic β -keto P(V) nucleophiles and exhibits broad compatibility across diverse organophosphorus classes, including phosphinates, phosphine oxides, and phosphonates. Mechanistic investigations suggest that configuration of the P-stereocenter originates from distinct steric environments within the diastereomeric chiral Ni-enolate intermediates, which govern the trajectory of electrophile approach during the stereodetermining C–C bond-forming event. Beyond the initial bond-forming process, the resulting P-stereogenic products can be readily transformed into structurally diverse chiral phosphorus building blocks, while also enabling stereodivergent access to all possible stereoisomers of the conjugate adducts.

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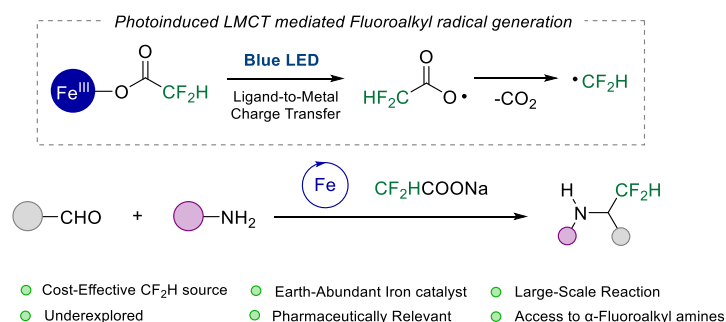
Photoinduced Multicomponent Difluoromethylation of Imines via Iron-Mediated LMCT

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α -Difluoromethyl(CF_2H) amines are valuable structural motifs in medicinal chemistry because the CF_2H group can serve as a lipophilic hydrogen-bond donor while the presence of fluorine can also contribute to improved metabolic stability.^{1,2} Despite their utility, existing methods for the direct radical difluoromethylation of imines often rely on preactivated CF_2H reagents and expensive photocatalysts. In this work, we developed an iron-mediated ligand-to-metal charge-transfer (LMCT) strategy that enables the use of inexpensive sodium difluoroacetate as a CF_2H source for the multicomponent difluoromethylation of imines generated in situ from aldehydes and amines. In this presentation, we will highlight this LMCT strategy for the practical synthesis of α - CF_2H amines and discuss its mechanistic features and synthetic scope.³



Scheme 1. Iron-mediated LMCT strategy for direct difluoromethylation of imines

Acknowledgment

This work was supported by the National Research Foundation of Korea (NRF) funded by the Ministry of Science and ICT (RS-2023-00218616, RS-2024-00351679, and RS-2025-02263193) and the Ministry of Education (RS-2025-25397599).

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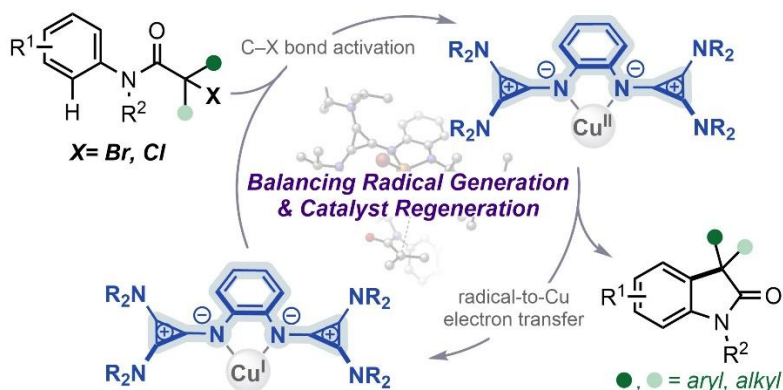
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Cyclopropenimine-Enabled Redox Control in Copper-Catalyzed Radical Cyclization to 3,3-Disubstituted Oxindoles

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Radical-mediated construction of all-carbon quaternary centers is a powerful strategy¹, yet its application to tertiary alkyl halides under mild conditions remains challenging due to the need to orchestrate multiple redox events. Herein, we report a cyclopropenimine-enabled copper-catalyzed radical cyclization that addresses this challenge. Mechanistic investigations reveal that catalytic efficiency arises from a balance between oxidative radical initiation and reductive catalyst turnover. This behavior is enabled by a phenylene-bridged cyclopropenimine scaffold² that modulates the redox behavior of the copper center.³ These findings highlight how the cyclopropenimine scaffold regulate competing redox processes within a single catalytic cycle and provide a foundation for future radical transformations involving challenging substrates.⁴

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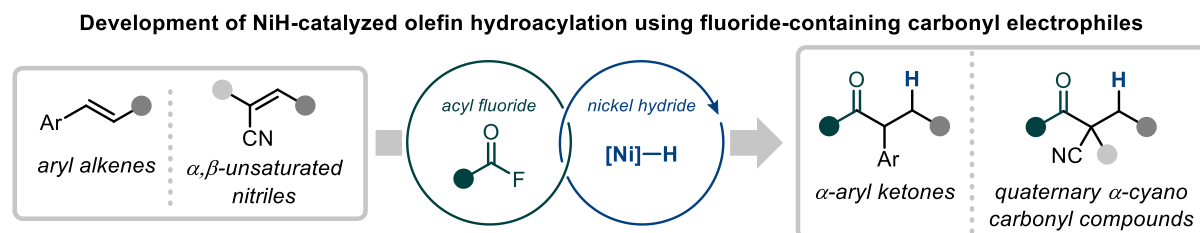
Ni-H Catalyzed Hydroacylation: A General Strategy for Accessing α -Substituted Carbonyl Compounds Using Acyl Fluorides

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α -Substituted carbonyl compounds represent an essential class of molecules in pharmaceuticals and natural products. Moreover, these structures serve as versatile synthetic intermediates for downstream modifications. As a result, significant efforts have been directed toward developing efficient and general strategies for their synthesis.¹ In this presentation, I will describe my research efforts toward establishing a practical and general approach for synthesizing α -substituted carbonyl compounds via nickel-hydride catalysis. The first part of this talk will focus on the development of hydroacylation using aryl alkenes and acyl fluorides, providing an efficient route to α -aryl ketones.^{2,3} The second part will cover the synthesis of α -cyano carbonyl compounds using α,β -unsaturated nitriles with acyl fluorides, along with their carbamoyl and formyl derivatives.⁴ Additionally, the robustness of these reactions and insights gained from mechanistic investigations will be described.



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Electrocatalytic Intramolecular Hydroamination for the Synthesis of Strained N-Heterocycles

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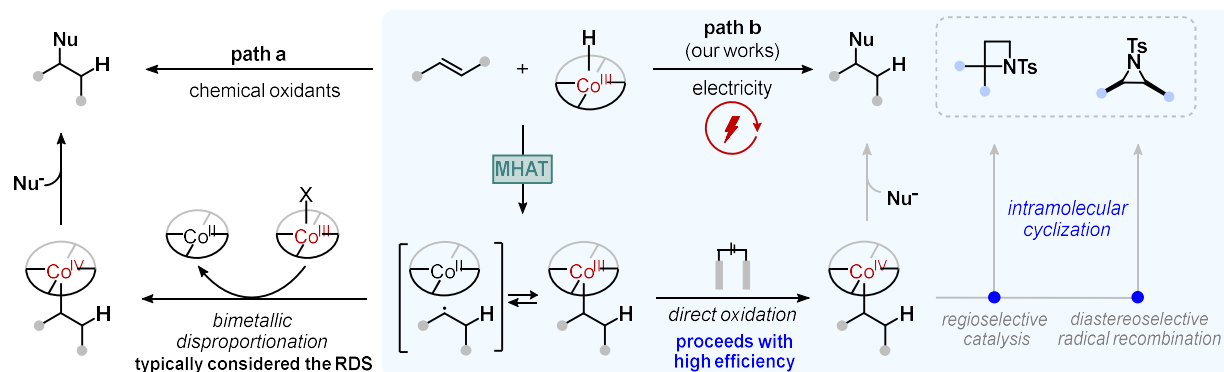
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Strained nitrogen heterocycles such as azetidines and aziridines are important structural motifs in medicinal chemistry and synthetic methodology, yet their synthesis remains challenging due to the high energetic barriers associated with small-ring formation and the difficulty of controlling highly reactive intermediates. In particular, conventional oxidative hydroamination strategies often suffer from competing radical pathways, low selectivity, or the requirement for strongly oxidizing conditions and high-energy nitrene reagents.

In this presentation, recent advances in cobalt-catalyzed electrocatalytic intramolecular hydroamination will be discussed as a strategy to overcome these limitations through electrochemical control of radical and organocobalt intermediates. By replacing conventional chemical oxidants with anodic oxidation, the cobalt catalytic system enables rapid and selective oxidation of transient intermediates, thereby reshaping the kinetic landscape of MHAT-mediated hydrofunctionalization reactions. This electrochemical platform enabled the efficient synthesis of strained azetidines through intramolecular allylic hydroamination by overcoming the intrinsic difficulty of 4-endo-trig cyclization via selective anodic oxidation of transient Co intermediates. Building upon this mechanistic foundation, controlled reactivity of electrogenerated alkyl-Co species further enabled highly diastereoselective synthesis of cis-aziridines through solvent-caged radical recombination followed by anodically promoted cyclization.

Together, these studies highlight how electrochemical cobalt catalysis can strategically manipulate radical intermediates to access strained nitrogen heterocycles that are difficult to synthesize using conventional approaches while achieving high levels of regio- and stereoselectivity.



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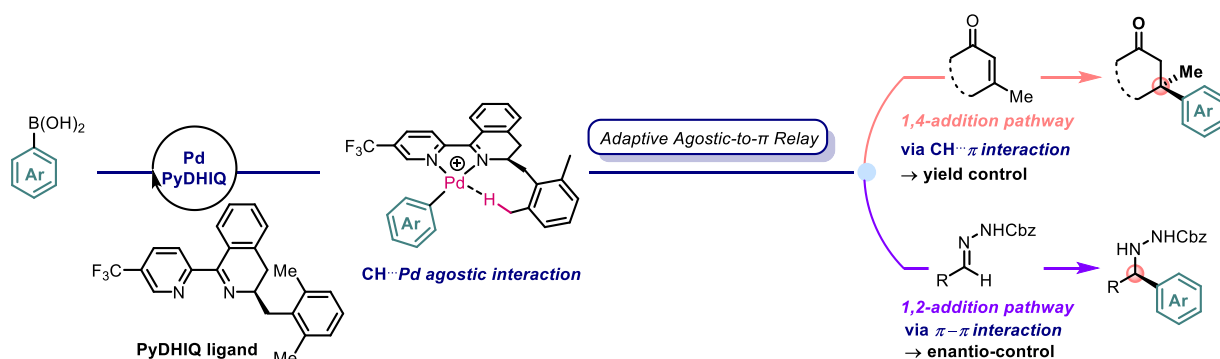
Harnessing an Adaptive Agostic-to- π Relay for Pd-Catalyzed Asymmetric 1,4- and 1,2-Arylation

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Bifunctional ligands have become powerful tools in asymmetric catalysis, where control is conventionally exerted by two functional groups within a single molecule. One group binds the metal while the other engages the substrate, and both operate simultaneously throughout the catalytic cycle. However, this static partitioning presupposes that a ligand's roles are fixed, leaving little room for a single interaction to adapt as the reactive intermediate changes. Herein, we report that a chiral Pd/pyridine–dihydroisoquinoline (PyDHIQ) catalyst operates through an adaptive agostic-to- π relay. In this relay, one ligand interaction is sequentially repurposed across the catalytic cycle. After transmetalation, the ligand stabilizes the coordinatively unsaturated cationic Pd through a Pd $\cdots$ H–C agostic interaction. As the intermediate evolves, this stabilizing role relays to a weak π -interaction with the substrate that governs the outcome. We establish this relay across two reaction modes. In the previously reported 1,4-conjugate arylation,¹ the relay hands off to a CH– π contact that stabilizes the productive resting state and suppresses an off-cycle deactivation pathway, thereby controlling yield. In the asymmetric 1,2-arylation of hydrazones, the same agostic onset relays to a π – π interaction that governs enantioselectivity. Across both reactions, the agostic interaction provides a common stabilizing anchor, while the subsequent π -interaction determines the outcome. Density functional theory with NCI and NBO/QTAIM analyses substantiates this mechanism.



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Cell-Penetrable Autophagosome-Tethering Supramolecular Peptide Self-Assemblies for Enhanced Autophagy Flux and Targeted Degradation

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Abstract

Autophagy maintains cellular homeostasis through lysosomal degradation of aberrant proteins and organelles. Autophagy-tethering compounds (ATTECs), which link pathogenic substrates to LC3 on phagophores, have emerged as a promising strategy for selective degradation, but their efficacy is limited by poor cell permeability and insufficient autophagic flux. Here, we report supramolecular autophagosome-tethering compounds (Supra-ATTECs) based on *in situ* peptide self-assembly that functionally mimic autophagy receptors. The cationic peptide assemblies form in proximity to LC3B on phagophore-associated membranes, thereby leading to a 3-fold increase in lysosomal abundance relative to untreated cells. Through co-assembly of substrate-binding and LC3-binding peptide monomers, Supra-ATTECs promote selective degradation of proteins or organelles. Owing to their high cationic nature derived from tri-arginine motifs, the peptide monomers can directly penetrate cell membranes via an energy-independent pathway and accumulate in the cytosol up to ~38-fold relative to the extracellular concentration. Supra-ATTEC markedly increases lysosomal abundance and promotes sequestration of the endoplasmic reticulum (ER) into autophagosomes and lysosomes, achieving up to ~75% reduction in ER content. Furthermore, Supra-ATTEC induces ER stress-associated apoptosis, increasing the early apoptotic cell population to 49.9% and reducing cell viability to below 20%. This platform can be further extended to other cellular targets, including the Golgi apparatus and cytosolic PD-L1. Collectively, this approach accelerates autophagosome formation, enhances lysosomal degradation, and amplifies autophagic processes, providing a versatile strategy for therapeutic modulation of autophagy.

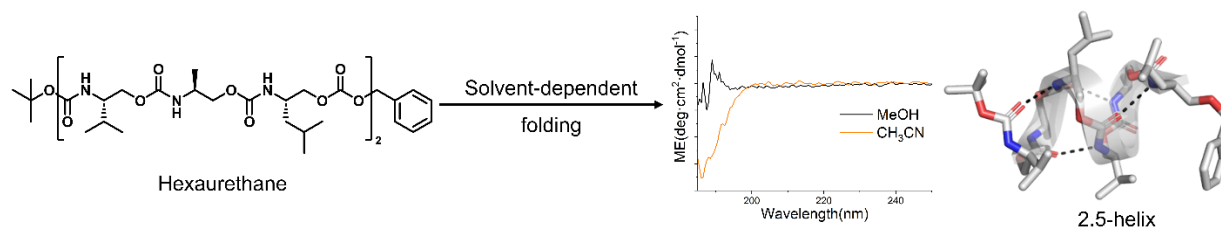
Solvatomorphic Behavior of a Sequence-defined *O*, *N*-Linked Hexaurethane Helix

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Peptidomimetic helices are synthetic molecules copying the structure and function of natural α -peptide helices.^[1, 2] Among them, sequence-defined *O*, *N*-linked oligourethanes represent a promising class for medicine,^[3, 4] although studies on their secondary structures remain limited.^[5] Here, we present synthesis and structural characterization of a hydrophobic *O*, *N*-linked hexaurethane consisting of proteinogenic acyclic side chains. X-ray crystallography revealed that the hexaurethane folds into 2.5-helix resembling its analogue, *N*, *N*'-linked oligoureas. Further analyses using CD and NMR support helical structure, notably solvatomorphic behavior. These results, together with further studies on various structural parameters, will provide design principles for oligourethane helices.



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Title: Discovery of PKM2 Tetramerization Activators as Potential Therapeutics for Autoimmune Diseases

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Abstract:

Pyruvate kinase M2 (PKM2) is an enzyme involved in the final step of glycolysis, where it catalyzes the conversion of phosphoenolpyruvate to pyruvate and generates ATP, which is essential for cellular energy production. PKM2 can exist in a highly active tetrameric form or a less active dimeric form. The tetrameric form of PKM2 supports normal glycolytic ATP production, whereas the dimeric form exhibits reduced catalytic activity and is closely associated with inflammatory signaling. In activated immune cells, including macrophages and microglia, dimeric PKM2 can translocate from the cytoplasm into the nucleus, where it interacts with and activates the transcription factor STAT3. This process promotes the expression of pro-inflammatory genes, such as IL-1 β , IL-6, and other cytokines, thereby contributing to immune dysregulation and neuroinflammation.

Multiple sclerosis (MS) is a chronic autoimmune neuroinflammatory disease characterized by aberrant activation of peripheral immune cells and resident microglia, leading to demyelination and neuronal damage in the central nervous system. Since PKM2 dimerization and nuclear translocation are closely linked to the inflammatory activation of immune cells, modulation of PKM2 has emerged as a potential strategy for controlling MS-associated neuroinflammation. In particular, small-molecule PKM2 activators that stabilize the tetrameric form of PKM2 may suppress inflammatory gene expression by preventing nuclear translocation of dimeric PKM2 and restoring metabolic homeostasis. Therefore, PKM2 activators represent a promising therapeutic approach for inflammatory and autoimmune diseases, including multiple sclerosis.

In this study, we report the design and synthesis of novel heteroaromatic compounds as PKM2 activators, capable of converting the dimeric form of PKM2 into its tetrameric form. This conversion prevents nuclear translocation and helps regulate normal cellular pathways. Preliminary results from molecular docking studies and biological evaluations of our compounds will be presented.

A de novo synthetic method towards cyclic oligosaccharides by way of Pd-catalyzed intramolecular asymmetric hydroalkoxylation of allenes

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Cyclic oligosaccharides are macrocycle made of sugars, potentially having cavity capable of host-guest interaction.¹ Designed alteration of cyclic oligosaccharide and understanding its impact on the cavity nature is highly limited. The key hurdle was the synthetic challenge, particularly cyclo-glycosylation. Herein, new synthetic approach towards efficient synthesis of cyclic oligosaccharides with varying sizes and constituting units is described. The core feature of the strategy is the sequential metal catalysis for glycosylation, highlighted by the Pd-catalyzed intramolecular asymmetric hydroalkoxylation of alkoxyallene.

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Electrochemical dearomatization of 2-naphthols for C–O bond formation

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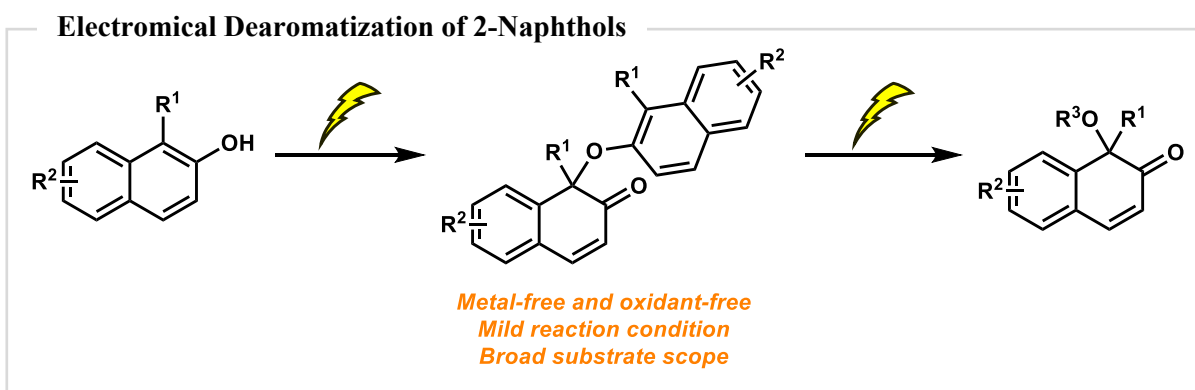
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Abstract

Dearomatization reactions provide an efficient strategy for transforming simple aromatic compounds into structurally complex and highly functionalized molecules. Among them, oxidative dearomatization of naphthols has attracted considerable interest because the resulting naphthalenone derivatives are valuable synthetic intermediates and common motifs in biologically active compounds. However, conventional methods typically rely on stoichiometric oxidants or transition-metal catalysts, which raise concerns regarding waste generation and sustainability. Organic electrochemistry has emerged as a green alternative that employs electric current as a clean redox reagent, enabling oxidative transformations under mild and environmentally benign conditions. In this study, we investigated the electrochemical dearomatization of 2-naphthols to achieve oxidative C–O homocoupling and subsequent alcohol addition reactions. Through anodic oxidation, dearomatized C–O coupled intermediates were generated and further functionalized with various alcohol nucleophiles, providing access to structurally diverse alkoxyated naphthalenone derivatives. This work demonstrates the utility of electrochemical oxidation as a sustainable platform for C–O bond-forming dearomatization reactions and the synthesis of functionalized naphthalenone scaffolds.



Scheme 1. Electrochemical dearomative oxidation reactions of naphthols.

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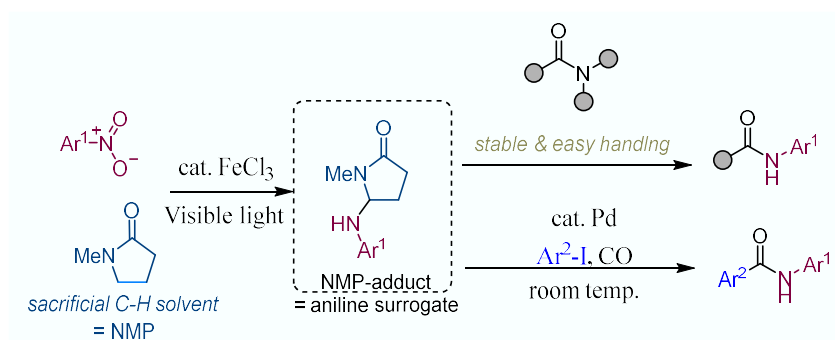
Photochemical Amide Synthesis from Nitroarenes

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Conventional amide synthesis typically relies on amines as nitrogen sources, which are often prepared via the reduction of nitro compounds using stoichiometric metals or harsh reductants, posing environmental and practical limitations. In this study, we developed a mild and sustainable photochemical method to use nitroarenes directly as nitrogen sources. This reaction uses a cooperative system of iron and visible light. Under light irradiation, FeCl_3 undergoes ligand-to-metal charge transfer (LMCT) and generates chlorine radicals. These radicals promote hydrogen atom transfer (HAT) from the solvent. Among the tested solvents, N-methyl-2-pyrrolidone (NMP) showed the best result. NMP reacts with nitroarenes to form an NMP-bound intermediate. Mechanistic studies suggest that this intermediate play an important role in reducing nitroarenes and generating an aniline-like species. This aniline-like species then acts as the real nitrogen source in the reaction. Using this strategy, we achieved iron-catalyzed transamidation¹ and aminocarbonylation² of nitroarenes under photochemical conditions. This method provides a simple and useful way to synthesize amides from nitroarenes without preparing amines in advance.



Scheme 1. Transamidation and aminocarbonylation using nitroarenes under photo conditions

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Photocatalytic Reconstruction of Bicyclo[1.1.0]butanes via Strain-Release Oxygenation

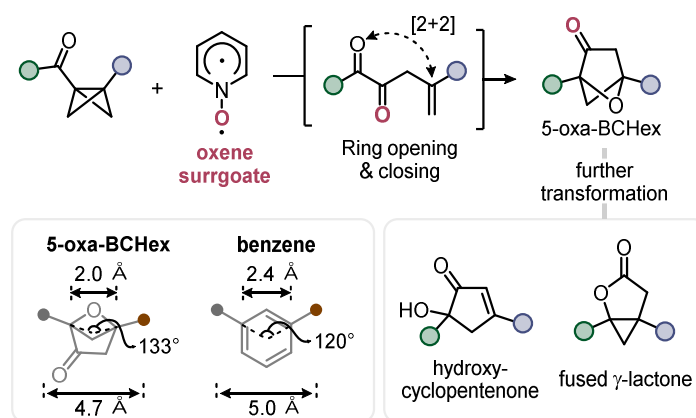
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Saturated benzene bioisosteres have attracted considerable attention owing to their improved physicochemical properties. However, synthetic methods for accessing site-diversified oxygenated bicyclic scaffolds remain limited. Herein, we report a photocatalytic reconstruction of bicyclo[1.1.0]butanes (BCBs) via strain-release oxygenation.¹ Under visible-light energy-transfer catalysis, pyridine N-oxides act as oxene surrogates, promoting selective bridge C–C bond cleavage to generate β,γ -unsaturated 1,2-diketones. Subsequent intramolecular Paternò–Büchi cycloaddition enables efficient reconstruction into 5-oxa-bicyclo[2.1.1]hexan-2-ones (5-oxa-BCHex). Mechanistic studies support a triplet energy-transfer pathway and reveal that a reversible [2+2]/retro-[2+2] process directs the reaction toward the desired oxygenated bicycles. Furthermore, the resulting products can be selectively transformed into hydroxy-cyclopentenones and cyclopropane-fused γ -lactones, providing divergent access to structurally distinct oxygenated scaffolds. This work establishes a new reactivity mode of BCBs and expands the chemical space of oxygenated three-dimensional bioisosteres.



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Mn-Catalyzed Aerobic Oxidative [3+2] Cycloaddition reaction using Azo/Hydrazide Redox

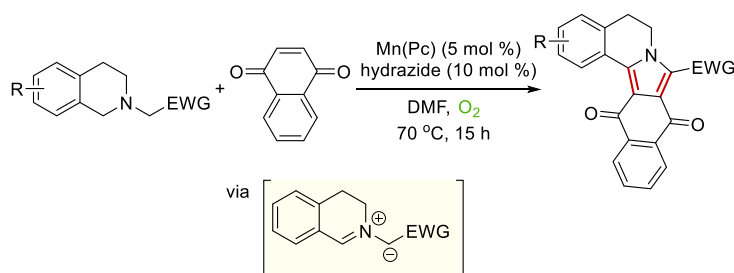
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Aerobic oxidative transformations using molecular oxygen are of importance in terms of green and sustainable chemistry because molecular oxygen is abundant and readily accessible, and water is produced as the sole byproduct. However, the direct oxidation of an organic substrate by O₂ is not facile due to the high energy barrier for electron transfer from a singlet organic substrate to triplet molecular oxygen. To overcome this limitation, our group has focused on implementing azo/hydrazide redox systems as efficient electron-transfer mediators to facilitate smooth aerobic oxidations under mild conditions.

The pyrrolo[2,1-*a*]isoquinoline core is a privileged heterocyclic scaffold widely found in numerous natural products and pharmaceutically active agents, exhibiting significant biological activities and optoelectronic properties. Despite its structural importance, conventional synthesis methods often require harsh reaction conditions, stoichiometric toxic oxidants, or multi-step sequences. In this presentation, I would like to introduce our recent efforts to develop a novel and practical aerobic oxidative synthesis of functionalized pyrrolo[2,1-*a*]isoquinolines using the azo/hydrazide redox system. Under the optimized conditions, a diverse range of substrates successfully underwent the oxidative cyclization to afford the target pyrrolo[2,1-*a*]isoquinolines in good to excellent yields. The detailed reaction mechanism, including the role of the azo/hydrazide mediator and the substrate scope, will be discussed.



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Enzyme-Instructed Self-Assembly of ER-Targeting Peptides for Selective Modulation of Cancer Cell Fate

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Enzyme-instructed self-assembly (EISA) promotes cancer cell death more efficiently when localized to particular organelles than when distributed throughout the intracellular space. Because enzyme expression levels vary among cell types, EISA enables selective targeting of cancer cells. Alkaline phosphatase (ALP), which is overexpressed in many cancer cell types, can trigger enzyme-instructed self-assembly. We present a novel strategy for targeting the endoplasmic reticulum (ER) in cancer cells. To improve EISA efficacy, we conjugated the peptide with *p*-toluenesulfonamide, a well-known ER-targeting motif. The resulting peptide assemblies localize to the ER, where they induce ER stress and dysfunction, ultimately leading to cancer cell death. The modified peptide exhibited a lower IC₅₀ in cancer cells than in normal cells, suggesting selective cytotoxicity toward cancer cells. The ER-targeting motif further reduced the IC₅₀ by more than twofold, indicating improved anticancer potency

Tertiary-Site Selective Deoxygenation of Unsymmetrical Diols Enabled by Polarized Silyloxonium Activation

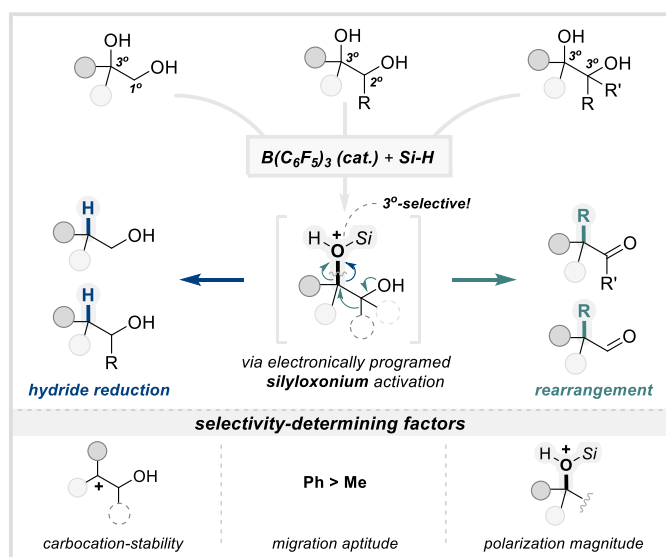
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Abstract

Site-selective deoxygenation of polyhydroxylated substrates remains a longstanding challenge, particularly when cleavage of a sterically hindered C–O bond is required. Herein, we report a $B(C_6F_5)_3$ /hydrosilane catalytic system that enables tertiary-selective deoxygenation of unsymmetrical diols through the intermediacy of a highly labile benzylic silyloxonium species. In contrast to the conventional preference of boron-mediated deoxygenation systems for less-hindered alcohol positions, the present strategy selectively targets the more substituted benzylic C–O bond. The protocol is applicable to a broad range of unsymmetrical diols, including $3^\circ/1^\circ$, $3^\circ/2^\circ$, and $3^\circ/3^\circ$ systems, delivering the corresponding tertiary deoxygenation products with high site selectivity. Mechanistic investigations reveal that the reaction proceeds through substrate-dependent hydride-transfer or rearrangement pathways, both originating from a common silyloxonium intermediate. Experimental and computational studies indicate that the observed reactivity and selectivity arise from the interplay of carbocation stabilization, migratory aptitude, and silyloxonium lability. This work establishes a general platform for selective C–O bond cleavage at sterically hindered positions and provides mechanistic insight into $B(C_6F_5)_3$ -catalyzed deoxygenation chemistry.



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구두 발표

Electroreductive Divergent Hydrogenations of Alkynes to Alkenes or Alkanes

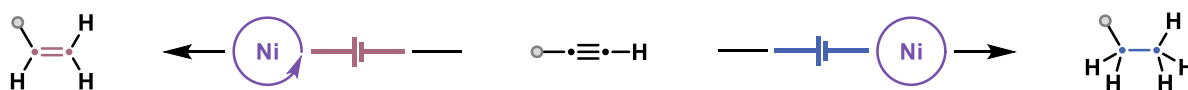
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Classical methods for alkyne reduction have been widely utilized, they are often considered less practical due to harsh reaction conditions and limited functional group tolerance, thereby prompting the search for alternative strategies. On the other hand, recent advances in electrocatalysis have emerged as a promising synthetic toolbox, setting the stage for innovative and sustainable approaches to a broad range of chemical transformations.

Nickel-catalyzed electrochemical alkyne reduction is known to proceed through either a ligand-assisted proton transfer pathway^[1, 2] or a nickel hydride^[3, 4] formation mechanism.^[5] In this study, we found that modulation of electrochemical parameters enables active control over the reactivity of these two other pathways.^[6] Under conditions *via* proton transfer, the reaction selectively affords alkenes, whereas conditions that promote the generation of nickel hydride species lead to complete reduction to alkanes. The origin of this selective pathway partitioning was verified through detailed isotope-labeling studies. The reactions proceed under mild conditions without the use of molecular hydrogen, featuring broad scope and high functional-group tolerance, thus providing a practical and sustainable approach to chemoselective alkyne reduction. The ability to selectively direct the reaction pathway solely through electrochemical control highlights this strategy as a sustainable and efficient platform for alkyne reduction.



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구두 발표

Axially chiral α -boryl-homoallenyl boronic esters as versatile toolbox for accessing centrally and axially chiral molecules

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Axially chiral allenes bearing organoboron groups are highly sought-after building blocks in organic synthesis due to their potential for generating a wide range of axially and centrally chiral molecules.¹ However, the existing methods for preparing axially chiral allenes containing boron group are primarily limited to the synthesis of allenyl boronic esters, and strategies for accessing axially chiral homoallenyl boronic esters are still scarce.² Here, we report the general method for synthesizing axially chiral α -boryl-homoallenyl boronic esters through a highly regio- and stereoselective copper-mediated S_N2' -addition of newly prepared (diborylalkyl)copper species to chiral propargyl electrophiles.³ The reaction conditions were optimized to achieve high yields and excellent stereospecificity. The obtained products were successfully transformed into various axially chiral allenes and other chiral molecules by transforming diboron units. The potential for axial-to-central chirality transfer of axially chiral α -boryl-homoallenyl boronic esters is also demonstrated through the stereospecific addition to aldehydes and N-H aldimines, yielding enantioenriched 1,2-oxaborinin-3,5-dienes and 2-aminomethyl-1,3-dienes.

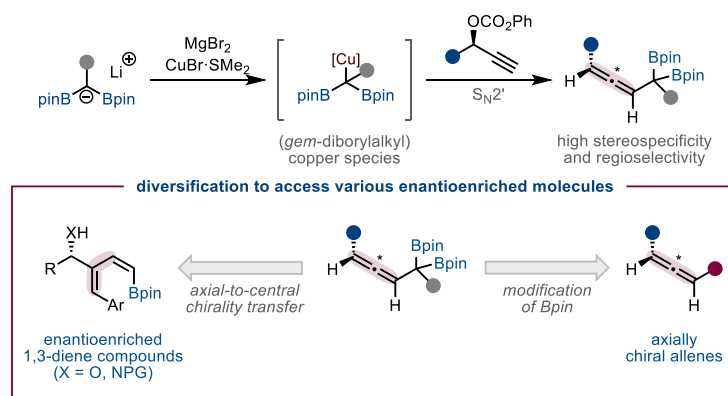


Figure 1. Synthesis and diversifications of axially chiral α -boryl-homoallenyl boronic esters.

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2026년 유기분과 하계워크숍 oral presentation

발표제목: Self-Association-Enabled Homo-EDA Activation for Visible-Light Aerobic Dehydrogenation of N-Heterocycles

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Abstract: Electron donor–acceptor (EDA) complexes have enabled diverse visible-light-driven organic transformations through charge-transfer (CT) activation, yet their activation has primarily relied on hetero-EDA or intramolecular assemblies. An activation strategy based on identical molecules remains largely unexplored. Here, we present homo-EDA as a self-association-enabled mechanistic framework in which identical N-heterocycles undergo concentration-dependent intermolecular interactions. This process generates electronically distinct excited-state behavior associated with photoinduced single-electron reactivity. Using 6-methyl-1,2,3,4-tetrahydroquinoline (6-MeTHQ) as a model substrate, visible-light excitation is proposed to access CT-enriched excited-state behavior consistent with transient radical ion character that initiates aerobic dehydrogenation. The transformation proceeds under visible light without additional catalysts or additives, and extends broadly to diverse N-heterocycles in batch, continuous-flow, and under natural sunlight. Spectroscopic and quantum chemical calculations provide observations consistent with concentration-dependent intermolecular associations and a photoinduced single-electron pathway interpreted within the proposed homo-EDA framework. Collectively, these findings suggest that identical molecules may cooperatively participate in intermolecular electronic interactions capable of enabling excitation-driven aerobic transformations.

Molecular engineering of IR820 based heavy-atom-free near-infrared photosensitizers for tumor theranostic application

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Near-infrared (NIR) fluorescence imaging-guided photodynamic therapy is a promising strategy for non-invasive cancer treatment. However, its clinical translation remains hindered by several limitations of existing photosensitizers, such as low reactive oxygen species (ROS) generation efficiency, limited photostability, and insufficient tumor selectivity. In this study, IR820-based photosensitizers that enable both NIR fluorescence imaging and efficient ROS generation were developed without the use of heavy atoms, and their therapeutic effects were demonstrated. IR820-1, IR820-2, and IR820-3 were synthesized by introducing electron-donating and sterically bulky substituents at the meso-position of the IR820 scaffold. Interestingly, the ROS generation efficiency was enhanced compared to IR820, as the substituents bulkiness induced molecular twisting, which suppressed excessive aggregation and promoted the formation of long-lived excited triplet states. In particular, IR820-3 revealed interaction with human serum albumin, accumulating in mitochondria, and thereby achieving efficient tumor ablation in vivo under NIR light irradiation. These findings provide an insight into the molecular design of multifunctional NIR photosensitizer based on cyanine platform and highlight its potential for clinical applications.

NiH-Catalyzed Enantioconvergent α -Alkenylation of Carbonyl Compounds via Markovnikov Alkyne Hydronickellation

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α -카이랄 중심을 갖는 β -메틸렌 카보닐 화합물은 천연물, 생리활성 화합물 및 의약품에서 빈번하게 발견되는 중요한 구조 모티프이며, 다양한 후속 알켄 기능화 반응이 가능한 유용한 합성 중간체이다. 그러나 기존 합성법은 강염기 사용, 카이랄 보조기 도입 또는 화학양론적 카이랄 시약을 필요로 하는 경우가 많아 범용적인 비대칭 합성에는 한계가 있었다. 본 연구에서는 니켈 하이드라이드(NiH) 촉매를 이용한 엔안티오수렴적(enantioconvergent) 하이드로알킬화(hydroalkylation) 반응을 개발하여 α -카이랄 β -메틸렌 카보닐 화합물의 효율적인 합성을 구현하였다. 본 반응은 알카인의 마르코프니코프(Markovnikov) 선택적 하이드로니켈화(hydronickellation)와 α -할로 카보닐 화합물과의 결합을 통해 진행되며, 다양한 기질에 대해 우수한 위치선택성 및 입체선택성을 나타냈다. 또한 넓은 기질 범위와 뛰어난 작용기 내성을 토대로 다양한 복잡한 구조에서도 좋은 결과를 보였으며, 온화한 반응 조건에서 효율적으로 진행되었다. 중수소 표지 실험 및 DFT 계산을 통해 마르코프니코프(Markovnikov) 하이드로니켈화(hydronickellation) 과정이 반응의 위치선택성을 결정하는 핵심 단계임을 확인하였다. 더불어 생성된 β -메틸렌 카보닐 화합물은 다양한 후속 변환 반응에 적용 가능함을 보여주어 본 방법론의 높은 합성적 활용성을 입증하였다. 본 연구는 쉽게 구할 수 있는 출발물질로부터 가치 있는 α -카이랄 β -메틸렌 카보닐 화합물을 효율적으로 합성할 수 있는 새로운 전략을 제시하며, 비대칭 NiH 촉매 반응의 활용 범위를 확장할 것으로 기대된다.

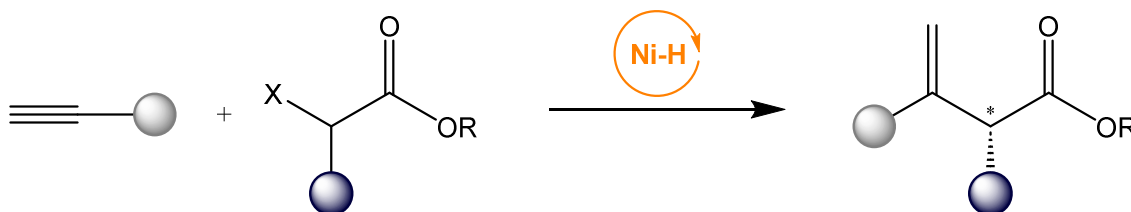


Figure 1. Ni-H-Catalyzed Alkyne Hydroalkylation

Total Synthesis of Pacharin, Bauhiniastatins 1–4, and Bauhinoxepins C–J with Structural Revision of Bauhinoxepin F

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This study introduces a novel approach for the total synthesis of analogues from two natural product families, bauhiniastatin and bauhinoxepin, which feature the dibenzo[*b,f*]oxepin and dihydrodibenzo[*b,f*]oxepin core structures, respectively. The bauhiniastatin family includes five known natural products, including pacharin and bauhiniastatins 1–4, while the bauhinoxepin family consists of nine members, from bauhinoxepins A to J. We report the total synthesis of all known natural products from both families, with the exception of bauhinoxepins A and B, as well as the synthesis of analogues not yet found in nature. During these studies, detailed spectroscopic analysis of the synthetic material revealed discrepancies with the originally reported structure of bauhinoxepin F. Comprehensive structural investigation led to a structural revision of bauhinoxepin F, thereby clarifying its correct molecular architecture.

Discovery of a KLHL41 Ligand for Muscle Specific Protein Degradation

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Despite the recent advancement of proteolysis-targeting chimera (PROTAC) development, they remain predominantly dependent on two E3 ligases, CRBN and VHL, which are ubiquitously expressed in all types of cells. Recently, efforts to discover tissue-specific E3 ligase ligands have gained attention as a promising strategy to enable tissue-specific protein degradation and avoid off-target tissue effects. Advancing this line of research, we discovered a ligand of KLHL41, a muscle-specific E3 ligase, through virtual screening. Building on the KLHL41 ligand, we developed KBD-1, a muscle-specific BRD4-targeting PROTAC with micromolar activity. To enhance degradation efficiency, we employed a two-body kinetic strategy, resulting in the covalent PROTAC cKBD-1, which achieved sub-nanomolar activity. Importantly, cKBD-1 demonstrated robust muscle-specific BRD4 degradation through KLHL41 recruitment both *in vitro* and *in vivo*. Moreover, the KLHL41 ligand enabled AR-targeting PROTAC development, demonstrating its broad applicability. These findings highlight the potential of KLHL41 as a platform for tissue-specific protein degradation and its applicability in therapeutic development.

Electrochemical Strain-Release Amination of Azabicyclo[1.1.0]butanes Using Nitroarenes

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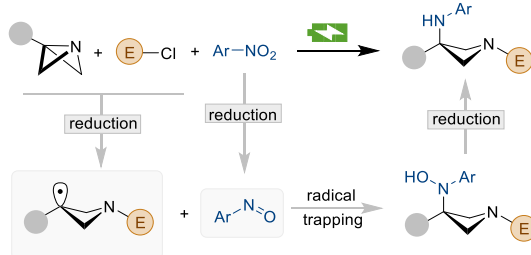
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Direct installation of aniline motifs onto azabicyclo[1.1.0]butanes (ABBs) through strain-release functionalization remains challenging because conventional polar conditions favor competitive coupling between electrophiles and anilines. Herein, we report an electrochemical strategy that addresses this limitation by employing nitroarenes as masked aniline equivalents through precisely controlled electron transfer. Under cathodic conditions, N-activated ABBs undergo selective reduction to generate C3-centered radicals, while simultaneous reduction of nitroarenes affords nitroso intermediates. Subsequent radical addition and electrochemical N–O bond cleavage enable direct access to aniline-functionalized azetidines in a single operation. The protocol proceeds under mild conditions and exhibits broad functional-group tolerance, accommodating a wide range of synthetically valuable N-sulfonyl and N-acyl substituents as well as diverse nitroarenes. By leveraging electrochemistry to achieve selective bond activation while avoiding stoichiometric reductants, this method provides a general platform for the difunctionalization of ABBs and enables access to aniline-functionalized azetidines that remain inaccessible through existing strain-release approaches.¹⁻⁴



Scheme 1. Electrochemical Strain-Release Difunctionalization of ABBs

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Development of a Fluorogenic Probe for Selective Detection of Cathepsin S

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Cathepsin S is a lysosomal cysteine protease that plays critical roles in various physiological processes, including antigen presentation, immune regulation, and extracellular matrix degradation. In particular, aberrant expression and dysregulated activity of cathepsin S have been closely associated with cancer progression and metastasis, as well as autoimmune diseases such as rheumatoid arthritis, highlighting its potential as an important biomarker for disease diagnosis and therapeutic monitoring. However, existing methods for monitoring cathepsin S activity still face limitations in selective and real-time detection within complex biological environments. In this study, we designed and synthesized a novel series of fluorogenic probes for the selective detection of cathepsin S activity. The probe series was rationally designed based on a non-peptidic cathepsin S inhibitor scaffold as an enzyme-specific recognition moiety through a reverse-design strategy, thereby overcoming the limitations associated with conventional peptide-based substrates. In addition, a self-immolative linker was incorporated to enable efficient fluorescence activation following enzymatic cleavage. Among the synthesized compounds, OSCB-CatS-1 exhibited rapid fluorescence activation upon reaction with cathepsin S, resulting in a pronounced fluorescence turn-on response. Furthermore, OSCB-CatS-1 demonstrated high selectivity toward cathepsin S over other closely related cathepsin family enzymes. These findings suggest that OSCB-CatS-1 represents a promising fluorogenic tool for the selective monitoring of cathepsin S activity and may facilitate the investigation of cathepsin S-associated pathological processes.

Reconstructing N-Terminal Hydrolase Active Sites for Biomimetic Catalysis

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Enzymes achieve remarkable catalytic efficiencies by positioning multiple functional elements within highly organized active sites. In N-terminal hydrolases, catalytic activity arises from the cooperative action of a nucleophile-base dyad, transition state stabilization, and precise spatial organization. Reconstructing these features in synthetic systems remains a significant challenge in biomimetic catalysis.

As a step toward enzyme-inspired organocatalysis, we sought to identify and reconstruct key functional elements of N-terminal hydrolase active sites. Catalytic dyads inspired by enzymatic active sites were designed and evaluated for acyl transfer reactions, and hydrogen bond donor motifs were introduced as oxyanion hole analogues to mimic transition state stabilization. To reproduce the geometric constraints present in enzyme active sites, these catalytic elements were incorporated into conformationally defined scaffolds that enable controlled spatial arrangement of functional groups.

Catalytic performance was assessed by NMR-based kinetic analyses, allowing evaluation of the individual catalytic elements and their combined effects on acyl transfer reactivity. This work provides a basis for understanding how active site architecture contributes to catalytic function in enzyme-inspired systems.

Keywords: N-terminal Hydrolase, Catalytic Dyad, Oxyanion hole

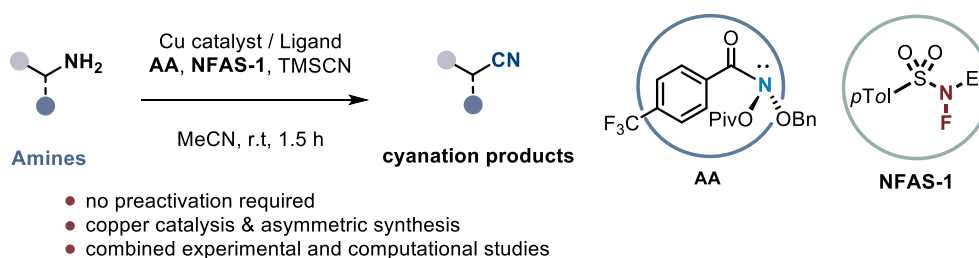
Mechanistic Investigation of Catalytic Deaminative Cyanation of Primary Amines

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Aliphatic amines are abundant feedstocks in organic synthesis, and their direct conversion into other functional groups represents an attractive approach to molecular diversification. In particular, nitriles are highly valuable motifs in medicinal and synthetic chemistry, yet direct transformation of primary amines into nitriles remains challenging because of the inertness of aliphatic C–N bonds. Here, we developed a catalytic deaminative cyanation of primary amines that enables efficient conversion of amines into nitriles under mild conditions. This strategy combines anomeric amide-mediated radical generation with copper catalysis to achieve direct C–CN bond formation from unactivated amines using TMSCN as the cyano source. The method exhibits broad substrate scope and provides access to synthetically versatile nitrile products. To gain insight into the reaction mechanism, combined experimental and computational studies were conducted to investigate the key elementary steps of the transformation. Computational studies elucidate the pathways of radical generation and copper-mediated C–CN bond formation. Together, these findings provide a detailed mechanistic understanding of the deaminative cyanation process.



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Application of bisNHC ligands in radical stabilization

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N-Heterocyclic carbenes (NHCs) have emerged as versatile ligands capable of stabilizing otherwise unstable or highly reactive species, owing to their strong σ -donating and π -accepting properties. With their tunable steric and electronic properties, NHCs have become essential tools in modern chemistry, enabling advances in catalysis, the stabilization of reactive intermediates, and main-group chemistry. Our group has explored the potential of NHCs to stabilize elusive organic radicals such as nitric oxide radicals[1] and 1,2-dicarbonyl radical cations[2], thereby contributing to the fundamental understanding of carbene-stabilized radical species.

In this study, we investigate bisNHC frameworks in which two NHC units are linked within a single molecular scaffold. Using these architectures, we successfully synthesized a bisNHC-stabilized nitric oxide radical and a bisNHC-stabilized 1,2-dicarbonyl radical cation, both of which were unambiguously characterized by EPR spectroscopy. Notably, the bisNHC-based nitric oxide radical system offers the unique capability of accommodating two NO units within a single molecular framework, potentially providing enhanced NO storage and release properties compared with conventional monodentate NHC–NO platforms. Such bisNHC–NO architectures may enable sequential or cooperative NO-release processes, thereby offering improved control over NO delivery in biological and catalytic applications. These findings demonstrate the potential of bisNHC frameworks as versatile platforms for the stabilization of organic radicals and the development of functional nitric oxide delivery systems.

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Chalcogen Atom Substitution in Organic Semiconductors for Developing Efficient and Stable Blue Phosphorescent OLEDs

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The operational stability of blue phosphorescent organic light-emitting diodes (PhOLEDs) is considered as one of the key challenges, largely due to the high driving voltage (V_d) required for blue electroluminescence. This causes charge imbalance and triplet exciton leakage, leading to efficiency roll-off and rapid degradation. Interfacial layers with high triplet energy (T_1), especially electron-blocking layers (EBLs), have been widely introduced to improve the device performance and stability through triplet exciton confinement, but their wide energy bandgap can rather increase V_d and accelerate device degradation.

In our previous study, a molecular design strategy of *ortho*-linked electron-blocking material (EBM) with high T_1 and herringbone-like molecular packing successfully improved device stability by significantly decreasing V_d .^[1] Building on this work, we introduce a strategy of chalcogen atom substitution that employs intermolecular chalcogen bonding (σ -hole interaction) to precisely control molecular packing of EBMs. The σ -hole is a region of low electron density along the extension of a chalcogen covalent bond that enables directional noncovalent interactions with electron-rich sites (lone pairs or negative electrostatic potential) and promotes denser intermolecular packing.

EBMs with different chalcogen substitutions (O and S) are designed and synthesized. Grazing-incidence wide-angle X-ray diffraction (GIWAXD) analysis reveals shortened π - π stacking distances in thin films, while photophysical measurements confirm that the energy levels including high T_1 are maintained upon chalcogen atom substitution. Therefore, enhanced hole mobility through improved molecular packing by chalcogen atom substitution is expected, ultimately improving the performance and stability of blue PhOLEDs.

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Improving the Conductivity and Stability of Silver Nanowires Through Spontaneous Ligand Exchange for Joule Heating

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Silver nanowires (AgNWs) are promising materials for optoelectronic devices, owing to their high transparency and conductivity. However, their performance is limited by polyvinylpyrrolidone (PVP) as an insulating capping agent that is essential for the synthesis of AgNWs but increases their intrinsic resistance. Herein, we introduce a facile spin-coating ligand exchange strategy that considers the physicochemical properties of ligands, including PVP solubility, viscosity, volatility, and hydrogen-bonding ability, to achieve a stable adsorption and efficient exchange. Among the tested ligands, ethylene glycol (EG) ligand effectively reduces the intrinsic resistance and enhances the optoelectronic properties of AgNWs by spontaneously replacing PVP and forming a stable EG...PVP hydrogen-bonded complex, as confirmed by multiple analysis methods. The ligand exchanged AgNWs electrode (AgNWs-EG) improves both in-plane and out-of-plane carrier transport properties as well as stability. Leveraging these properties, AgNWs-EG exhibits a 35% increase in Joule heating performance compared to the pristine AgNWs electrode and remarkable stability at elevated temperatures around 120 °C. Moreover, the performance of AgNWs-EG can be further enhanced through their combination with MXene.

Photoredox-Mediated Ring Opening of Aminocyclopropanes for the Synthesis of N-Acyl-N,O-Acetal-Linked Pyridines

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Pyridine and quinoline motifs are prevalent in biologically active molecules and pharmaceutical agents, yet the efficient incorporation of functionalized side chains into these heteroaromatic frameworks remains challenging, particularly in structurally complex settings. Herein, we report a visible-light-enabled strategy that utilizes aminocyclopropanes as precursors to N-acyl-N,O-acetal linkers, allowing their direct installation onto pyridine derivatives under oxidant-free conditions. Photoinduced ring opening generates carbon-centered radicals that engage N-aminopyridinium salts to form C(sp³)-C(aryl) bonds selectively at the C4 position of the pyridine ring. The resulting N-centered radical promotes photocatalyst turnover, enabling an efficient catalytic cycle. Subsequent nucleophilic trapping furnishes N-acyl-N,O-acetal products with broad substrate scope, encompassing diverse pyridines, quinolines, and aminocyclopropanes, including complex molecules suitable for late-stage derivatization. Moreover, replacing methanol with TMSN₃ provides azide-containing analogues, further expanding product diversity. The resulting N-acyl-N,O-acetal motifs serve as versatile synthetic intermediates for downstream diversification of pyridine-based medicinally relevant compounds.

Cu-Catalyzed Stereo- and Regioselective Disilylation and Sequential Silylation/Borylation of CF₃-Containing 1,3-Enynes

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Organosilane and organoboron compounds have emerged as valuable building blocks in modern synthetic chemistry owing to their low toxicity, high functional group tolerance, and versatile reactivity.^[1] In parallel, the trifluoromethyl (CF₃) group is widely recognized as a valuable substitute for a methyl group because of its ability to improve metabolic stability and pharmacokinetic properties.^[2] Consequently, the incorporation of CF₃ units into molecular frameworks has become an important strategy in medicinal chemistry and drug design. Despite this growing interest, the development of disilylation and sequential silylation/borylation reactions of CF₃-containing 1,3-enynes remains limited.

Herein, we report a copper-catalyzed stereo- and regioselective disilylation as well as sequential silylation/borylation of CF₃-containing 1,3-enynes. The sequential silylation/borylation of a phenyl-substituted 1,3-enyne as a model substrate led to (*Z*)-1-silyl-4-boryl alkene in 96% yield with excellent stereoselectivity (>98:2 *Z/E*). In addition, a substrate scope consisting of 12 examples was investigated, affording products in up to 94% yield with excellent *Z/E* selectivity (>98:2). Furthermore, the disilylation of a phenyl-substituted 1,3-enyne provided the corresponding (*E*)-1,4-disilyl alkene in 70% yield with excellent stereoselectivity (>98:2 *E/Z*).

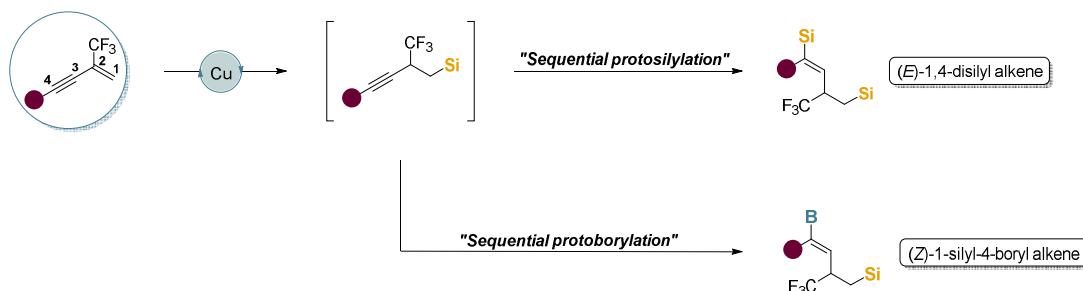


Figure 1. Cu-catalyzed disilylation and silaborylation of CF₃-containing 1,3-enynes

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General Approach to α -Branched Amines via Nickel-Catalyzed Alkylation of Imines with Primary, Secondary, and Tertiary Unactivated Alkyl Halides

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α -Branched amines are prevalent structural motifs in pharmaceuticals, natural products, and agrochemicals owing to their three-dimensional architectures and favorable binding interactions with biological targets. Although numerous synthetic methods have been developed for the construction of α -branched amines, existing approaches often suffer from significant limitations. In particular, nucleophilic addition to imines has emerged as a direct strategy for α -branched amine synthesis; however, its reliance on preformed organometallic nucleophiles limits practicality and functional group compatibility.

Recent advances in nickel-catalyzed cross-electrophile coupling have enabled the reductive alkylation of imines using bench-stable carbon electrophiles. However, these methods generally rely on directing group-assisted imines and remain largely limited to activated electrophiles such as benzyl halides.¹ Herein, we report a broadly applicable nickel-catalyzed alkylation of imines with unactivated alkyl halides, including primary to tertiary alkyl halides, that proceeds without additional directing groups.² This catalytic system enables the efficient synthesis of α -branched amines from a wide range of alkyl electrophiles, providing a practical and versatile alternative to conventional organometallic-based approaches.

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**Rational Design of Lewis Acid-Base Dual-Doped Graphene via
Sonocavitation Strategy: Electronic Modulation for Ambient C-N Coupling**

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Developing advanced electrocatalytic materials for artificial nitrogen fixation is critical to overcoming the energy-intensive limitations of the conventional Haber-Bosch process. However, designing non-metal catalysts with precise active sites for sustainable C-N coupling remains a significant challenge. Herein, we report the synthesis of Lewis acid and Lewis base dual-doped graphene as a highly efficient electrocatalyst for ambient urea synthesis. By employing a unique sonocavitation and nebulization synthesis (SNS) strategy, we utilized acoustic cavitation energy to effectively incorporate heteroatoms into the graphitic lattice while maintaining its hierarchical structure. This material design provides abundant active sites and leverages the inherent hydrophobicity of the graphene scaffold to physically suppress the parasitic hydrogen evolution reaction (HER). The dual-doping strategy induces a powerful synergistic effect via a cooperative "push-pull" electronic modulation. These acid and base sites enable a dual-binding mechanism that stabilizes key intermediates, facilitating both N₂ activation and the CO₂ reduction reaction (CO₂ RR). Lewis acid sites withdraw electron density, while Lewis base sites inject electrons into anti-bonding orbitals. This tuning destabilizes inert N≡N and C=O bonds, drastically lowering the activation energy barrier for C-N coupling. Ultimately, the resulting catalyst exhibits

excellent electrochemical performance, achieving high selectivity for ammonia and urea synthesis at low overpotentials, with product origins confirmed via isotope labeling.

Presentation style: oral () poster (o)
Title: An Activatable Dexamethasone-Prodrug Strategy to Eradicate Multidrug-Resistant Cancer
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Abstract: The persistence of residual cancer cells with chemoresistant phenotypes continues to pose a major obstacle in cancer therapy, contributing to metastatic progression and disease relapse. Herein, we introduce Dex–Dox, a reactive oxygen species (ROS)-activated prodrug developed to counter multidrug resistance (MDR). The system was constructed by linking the anti-inflammatory glucocorticoid dexamethasone (Dex) to doxorubicin (Dox) through an oxidative stress-responsive linker. In vitro studies showed that Dex–Dox effectively restored drug sensitivity in resistant MCF7/ADR cells, leading to enhanced apoptotic cell death accompanied by PARP1 cleavage and reduced VEGF expression. In addition, in vivo investigations demonstrated that Dex–Dox significantly inhibited tumor progression in Dox-resistant murine models while exhibiting minimal systemic toxicity. Collectively, these results indicate that ROS-mediated co-delivery of Dex and Dox may provide an effective synergistic approach for overcoming MDR and enhancing therapeutic efficacy against resistant tumors.

HFIP-Mediated Metal-Free Synthesis of Tetrahydroisoquinolines

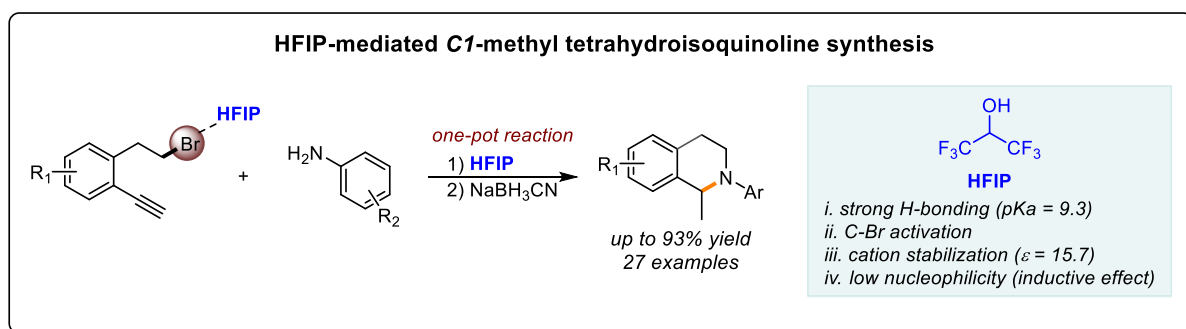
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1,1,1,3,3,3-Hexafluoro-2-propanol (HFIP) is a unique solvent with strong hydrogen-bond donating ability and high ionizing power, enabling the stabilization of cationic intermediates and facilitating the activation of inert C–X bonds. Building upon our previous transition-metal-free approaches to N-heterocycles, this study expands the utility of HFIP to synthesis of tetrahydroisoquinoline (THIQ) scaffolds, which prevalent in bioactive natural products and pharmaceuticals.

Traditional methods for THIQ synthesis often rely on harsh conditions or transition-metal catalysts. Here in, we report a metal-free cascade cyclization of bromoalkyl phenylacetylene derivatives with anilines. Under HFIP conditions, initial N-alkylation is followed by intramolecular cyclization promoted by in situ generated HBr, eliminating the need for external acid additives. Substrate scope studies revealed that electron-donating substituents on anilines enhance reactivity, whereas strongly electron-withdrawing groups suppress the reaction. Ongoing mechanistic investigations, including Hammett analyses, aim to elucidate the underlying reaction pathway.



포스터 발표

Design and Characterization of Metal-Foldamer Cages

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Metal-organic cages (MOCs) provide well-defined cavities, capable of encapsulating guest molecules. However, most existing platforms consist of rigid aromatic ligands, resulting in limited structural flexibility compared to protein hosts. In this study, we designed symmetric peptide foldamers with 2,2'-bipyridine units at the terminals for chelation. We synthesized a series of these ligands of varying lengths and characterized their solution-phase folding behavior and basic chiral optical properties through NMR, UV-vis, and circular dichroism (CD) spectroscopy. Coordination studies with Fe(II) produced consistent, high-resolution MS, proton NMR, and DOSY data indicating coordination and higher-order assembly at specific stoichiometric ratios and conditions. While the precise three-dimensional structure of individual cage species remains unclear, this work provides practical spectroscopic indicators and experimental conditions for cage-like structure formation. These results will facilitate future research toward developing structurally verified, stimulus-responsive, and dynamically adaptive foldamer cages.

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Cavitation-Induced Mn-O-C Bond Formation in MnO₂/Conductive Carbon for Binder-free Zn-MnO₂ Battery.

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As the demand for safe and sustainable energy storage systems increases, aqueous zinc-ion batteries (AZIBs) have emerged as promising alternatives to lithium-ion batteries owing to the abundance of zinc resources and intrinsic safety. In AZIBs, manganese dioxide (MnO₂) is attractive cathode material because of relatively high operating voltage. However, Zn–MnO₂ batteries suffer from limited capacity and rapid capacity degradation, caused by the poor electrical conductivity and structural instability of MnO₂. To overcome these limitations, various conductive additives and polymeric binders for suppressing Mn ion dissolution have been reported. Nevertheless, these conventional strategies rely on physical blending of the composites, which results in limited electron transport and insufficient suppression of structural transformation.

Herein, we propose a chemically bonded strategy to enhance conductivity and stability. Interfacial Mn-O-C chemical bonds between MnO₂ and conductive additives are generated by cavitation under ultrasonic irradiation. Implosion of vacuum bubbles in liquid produces high thermodynamic energy, enabling Mn-O-C bond formation. The resulting bonded composites are subsequently nebulized and deposited onto the current collector. In addition, employing wire-like carbon nanotubes (CNTs) enable robust anchor Mn-O-C bonded composites to the current collector without electrically inactive binder. As a result, binder-free MnO₂ cathode with conductive Mn-O-C network is fabricated by cavitation and it exhibits significantly improved performance compared to blending-based MnO₂ cathode. These results highlight the critical role of sonochemically generated Mn-O-C bonds in conductivity improvement and binder-free fabrication for high performance Zn batteries.

Cathepsin K-Responsive Turn on probe for Real-Time Monitoring of Osteoclast activity

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Cathepsin K (CatK) is a cysteine protease predominantly expressed in osteoclasts and plays a critical role in osteoclast-mediated bone resorption. It serves as a biomarker of osteoclast activity in bone diseases such as osteoporosis and bone metastasis. However, conventional methods for analyzing osteoclasts mainly rely on histological analysis, which requires animal sacrifice, bone tissue collection, and multiple processing steps. These methods also have limitations in real-time monitoring of osteoclast activity. In addition, even with multiphoton imaging, it remains challenging to observe the number and activity of osteoclasts at high resolution within intact and complex bone microenvironments, such as hindlimb long bones. To overcome these limitations, this study developed CatKP1, a two-photon FRET-based fluorogenic probe that responds to CatK activity.

CatKP1 consists of a TMR fluorophore and a BHQ2 quencher connected by a CatK-recognizable peptide sequence. Before peptide cleavage, TMR and BHQ2 are located close to each other, resulting in quenched fluorescence through FRET. Upon cleavage by active CatK, the fluorophore and quencher become separated, leading to fluorescence activation through a turn-on strategy. CatKP1 showed an approximately 73-fold fluorescence enhancement in response to active CatK, and an inhibition assay with odanacatib confirmed that this response was CatK-dependent. CatKP1 successfully visualized active CatK during osteoclast-mediated bone resorption and showed reliable fluorescence responses in osteoclast-related bone disease models. Therefore, CatKP1 is a promising fluorescent probe that enables real-time monitoring of CatK activity in osteoclast-related bone diseases and may be valuable for evaluating disease progression and therapeutic efficacy.

포스터 발표

**Synthesis of Redox Polymers Based on Acyl Azide-Functionalized
Biimidazole-Osmium Complexes for Glucose Biosensors**

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Electron transfer mediators are crucial in blood glucose sensors for facilitating electron transfer from the flavin adenine dinucleotide (FAD) cofactor of glucose dehydrogenase (GDH) to the electrode. Because FAD is deeply embedded within the enzyme structure, direct electron transfer is limited, necessitating the construction of a mediator-based polymer matrix to ensure sufficient signal transduction.

In this study, we synthesized a novel osmium (Os)-centered metal complex as an electron transfer mediator, leveraging its inherently fast redox kinetics and precisely tunable redox potential via ligand modification. Specifically, to achieve a desirable redox potential and maximize immobilization efficiency, we designed an Os complex coordinated with biimidazole ligands and a secondary ligand bearing highly reactive acyl azide functional groups. These acyl azide groups are designed to form robust covalent bonds with the amine ($-NH_2$) groups of a water-soluble polymer matrix, thereby synthesizing a firmly cross-linked redox polymer.

This design strategy chemically anchors the mediator within the polymer network, significantly strengthening the interfacial bonding between the mediator, the GDH-FAD enzyme, and the matrix. Consequently, this approach ensures high structural stability of the sensor and establishes a highly efficient electrochemical signal transduction system.

Visible-Light-Induced Photoreductive Degradation of Fe(III)–Catechol Hydrogel Networks

Ukhyeon Kim and Beom Jin Kim*

Presenter : Ukhyeon Kim

Presentation title : Photoreductive disassembly of Fe(III)–Catechol Hydrogels under Visible light

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Stimuli-responsive hydrogels have attracted significant interest for drug delivery and biomedical applications. Among external stimuli, light is particularly advantageous because it enables remote and spatiotemporal control. However, most photodegradable hydrogels rely on ultraviolet (UV) light, which may cause cellular damage. Here, we developed a visible-light-responsive hydrogel based on the photoreductive disassembly of Fe(III)–catechol coordination crosslinks. Fe(III)–citrate was incorporated into a catechol-functionalized carboxymethyl cellulose (CMC–Cat) network to form Fe(III)–catechol-crosslinked hydrogels. Upon visible-light irradiation, Fe(III) was reduced to Fe(II), leading to disruption of the coordination network and hydrogel degradation. The hydrogel remained stable under physiological conditions without light while showing rapid degradation under visible-light exposure. In addition, degradation of the hydrogel enabled efficient release of encapsulated cargo molecules. Furthermore, the release kinetics could be systematically modulated by varying the light intensity, consistent with photon-flux-dependent photoreduction. These results demonstrate a versatile visible-light-degradable hydrogel platform for spatiotemporally controlled cargo release and biomedical applications.

포스터 발표

**Direct Covalent Conjugation of Glucose Dehydrogenase with
Benzisothiazolinone (BIT)-Functionalized Osmium Complexes**

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Developing efficient molecular wiring between redox enzymes and electrode surfaces is paramount for achieving high sensitivity and rapid response in electrochemical biosensors. This study presents a novel strategy for the direct integration of glucose dehydrogenase (GDH) with a redox mediator by synthesizing an osmium complex functionalized with a 1,2-benzisothiazol-3(2H)-one (BIT) moiety at the ligand terminus. The BIT derivative acts as a highly specific electrophilic linker capable of forming robust covalent bonds with the nucleophilic surface amine groups of GDH, bypassing the need for traditional polymer-based immobilization scaffolds.

The osmium complex was designed with bipyridine ligands to exhibit a low redox potential (ca. 0 V vs. Ag/AgCl), effectively suppressing the oxidation of common interferents in physiological fluids. Upon simple incubation of the BIT-functionalized osmium mediator with GDH, spontaneous stoichiometric conjugation occurred, resulting in a stable enzyme-mediator complex. This direct molecular linkage significantly reduces the electron tunneling distance compared to conventional redox hydrogels, thereby enhancing the heterogeneous electron transfer rate.

The GDH-Os conjugate will maintain high catalytic activity and exhibit superior structural stability, preventing mediator leaching during continuous operation. This approach of utilizing BIT-mediated skeletal-linking for enzyme immobilization provides a streamlined and efficient platform for the development of high-performance, miniaturized electrochemical sensors for real-time glucose monitoring.

Pd-Catalyzed Stereospecific Spirocyclization

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Spiro compounds are bicyclic structures in which two rings are connected through a single shared atom, related to their inherent rigidity and three-dimensional architectures. Although several methods for spirocycle synthesis have been reported, most rely on preinstalled functional groups, which limits their general applicability. In contrast, our approach enables stereospecific spirocyclization under unified catalytic conditions, providing a more general and efficient entry to spirocyclic frameworks. Herein, our strategy employs a Pd-catalyzed intramolecular Suzuki C(Sp³)–C(Sp²) cross-coupling within a carbon-chain framework to achieve spirocyclization, where careful optimization of the solvent and ligand enables high stereospecificity to be maintained. This work addresses the limited generality of existing methods and demonstrates that catalytic cross-coupling can serve as an efficient platform for constructing spirocycles with diverse structural outcomes.

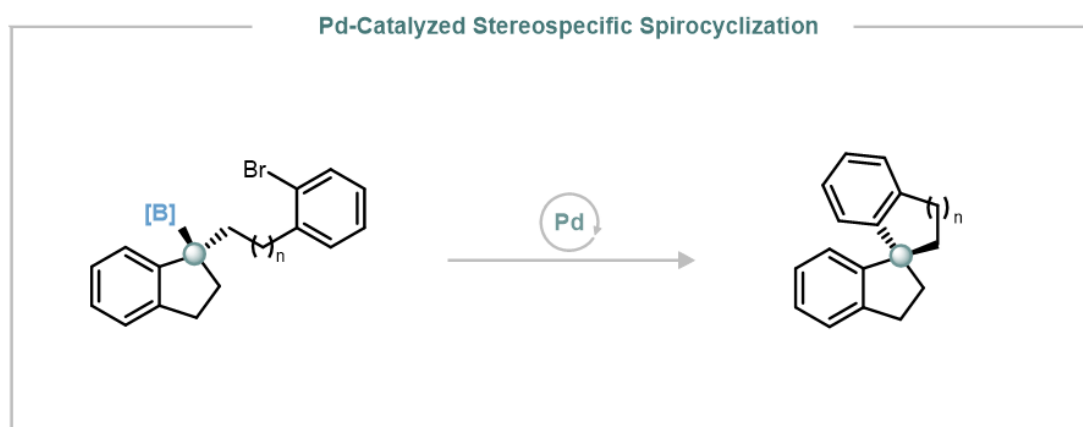


Figure 1. Reaction design: stereospecific Intramolecular cross-coupling

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[Poster Presentation]

Synthesis of Non-Natural Urea Ligands for Biomimetic Organometallic Catalysts

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Coordination polymers derived from α -amino acids offer attractive features such as chirality and biocompatibility, yet the use of unnatural amino acids in these systems remains limited. Here, we synthesized two peptide-based ligands, NH₂-Val-Aib-OH and OH-Val-Aib-OH, for coordination with Zn(II) and Cu(II) ions. The incorporation of α -aminoisobutyric acid (Aib) is expected to impose conformational rigidity on the peptide backbone, enabling more predictable coordination geometries and promoting supramolecular assembly. By comparing the influence of terminal –NH₂ and –COOH groups, this study aims to clarify how subtle ligand modifications govern coordination modes and network topology, ultimately guiding the rational design of peptide-based architectures for artificial metalloenzymes and sustainable hybrid materials.

Chemoselective Photochemical Debenzylation of Amides

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N-Benzyl groups have long been employed as valuable protecting groups for nitrogen-containing compounds in organic synthesis. Although their use in amine protection is well established, the protection of amides with *N*-benzyl groups has received comparatively less attention due to the inherent difficulty associated with their deprotection.^[1] Despite the availability of various methods for *N*-benzyl removal, achieving high levels of chemoselectivity remains a persistent challenge. This issue becomes particularly pronounced in molecules containing multiple benzyl substituents, where the selective cleavage of a single benzyl group is often difficult to accomplish. Herein, we present a photoredox-catalyzed strategy for the chemoselective deprotection of *p*-methoxybenzyl (PMB) amides under mild reaction conditions.

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Halogen-Mediated Divergent Intramolecular Hydroamination for the Synthesis of Pyrrolidine derivatives

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Pyrrolidine is one of the important nitrogen-containing heterocyclic motifs widely found in pharmaceuticals and biologically active compounds.^[1] Among the various synthetic approaches toward pyrrolidines, intramolecular cyclization reactions have emerged as efficient methods for ring construction.^[2] In particular, cyclization strategies involving halogen reagents have proven useful for the synthesis of functionalized nitrogen-containing heterocycles.^[3] In this work, products generated through Rh(II)-catalyzed sigmatropic rearrangement were employed as versatile intermediates for halogen-mediated cyclization, enabling access to structurally diverse substituted pyrrolidines.

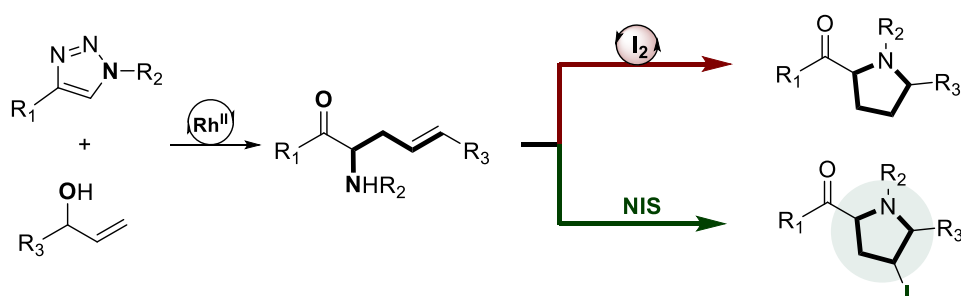


Figure 1

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Towards the total synthesis of suffranidine A

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Suffranidine A, a natural product isolated from *Flueggea suffruticosa*, features an unprecedented 8/5/6/5/6/6/6/6-fused octacyclic framework. The compound has demonstrated notable bioactivity by inducing neuronal differentiation and promoting neurite outgrowth.^[1] Inspired by the proposed biosynthetic pathway, involving the intramolecular Diels–Alder reaction, we synthesized the putative biosynthetic precursor through the singlet oxygen-mediated oxidative cleavage of 2,3-dehydroallosecurine^[2], followed by the cross-coupling reaction. The infeasibility of the biosynthetic hypothesis was examined by performing the Diels–Alder reaction on the proposed precursor. We are currently devising a new synthetic route starting from an L-proline derivative to enable the modification of the [4+2] cycloaddition precursor and achieve the total synthesis of suffranidine A.

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Light-Driven Redox Modulation of 9,10-Phenanthrenequinone for Amplified Radical-Based Reactive Oxygen Species Production

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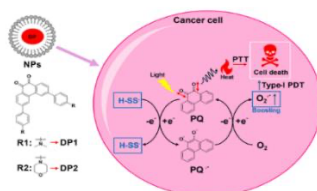
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Quinone-based redox cycling systems are known to generate reactive oxygen species (ROS) through sequential electron transfer processes. However, whether photoexcitation can modulate quinone redox energetics and thereby accelerate the redox cycle, independently of intersystem crossing (ISC)-mediated triplet-state pathways, remains poorly understood.

In this study, 9,10-phenanthrenequinone (PQ) derivatives with a donor–acceptor–donor (D–A–D) structure were designed to extend visible-light absorption and promote intramolecular charge transfer. Although fluorescence quenching indicated that non-radiative decay processes dominate excited-state relaxation, the redox cycle rather than ISC was identified as the primary pathway for ROS generation under light irradiation. Electrochemical analysis revealed enhanced oxidation and reduction peak currents under irradiation compared to dark conditions, demonstrating that photoexcitation alters the effective redox behavior of PQ. In the dark, electron transfer to molecular oxygen is thermodynamically nonspontaneous. Photoexcitation elevates the energy state of PQ above that of molecular oxygen, rendering this process spontaneous and leading to accelerated redox cycling.

As a consequence, type I ROS generation, including $O_2^{\bullet-}$ and $OH^{\bullet}$, was significantly increased under irradiation, while singlet oxygen production remained negligible. This supports that the electron-transfer-driven redox cycle of PQ, rather than ISC-mediated triplet-state processes, governs type I ROS generation under light irradiation. Interaction with polysulfides further promoted radical generation under light irradiation. These findings demonstrate that photoexcitation regulates quinone redox cycling as a mechanistically distinct route, offering a promising design principle for future type I photosensitizer design.



Scheme 1. Schematic illustration of DP1/DP2 NPs for photoexcitation-regulated redox cycling and type I PDT/PTT synergistic cancer therapy

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포스터 발표

Toward the Total Synthesis of Herpotriquinones

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Herpotriquinones A and B were isolated from the isopod-associated fungus *Herpotrichia* sp. SF09 in 2024 has a unique pyran-bridged structure constructed with a formal [3 + 3] cycloaddition between naphthoquinone and epoxyquinol monomer.^[1] Additional experiments showed the natural products potent anti-neuroinflammatory activity, which is proposed to suppress the activation of the NF- κ B and MAPK signaling pathways.

Here we report our ongoing study toward the total synthesis of herpotriquinones A and B. The formal [3 + 3] cycloaddition of synthesized naphthoquinone^[2] and epoxyquinol^[3] monomer shows a remarkable intramolecular cascade reaction. Further investigation gives one step short until completing the total synthesis of the natural product.

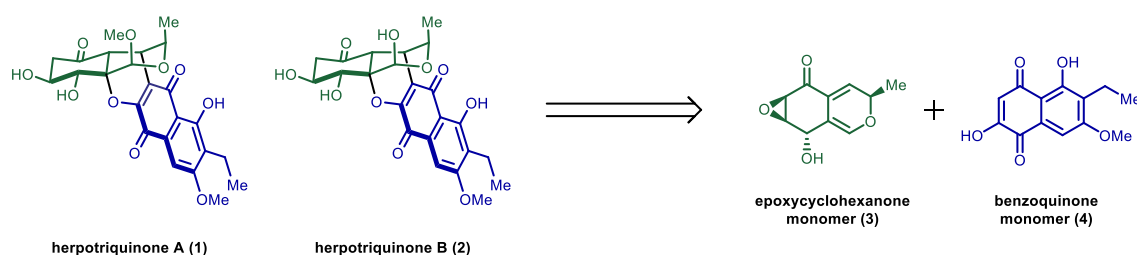


Figure 1. Synthetic design for herpotriquinones A and bB

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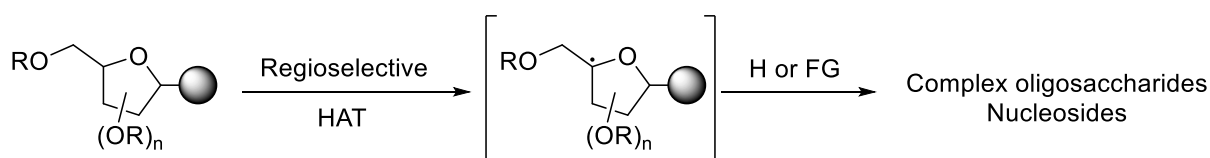
Regioselective HAT Mediated Direct Modification of Furanosides

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Modified glycosides and their nucleoside analogs have played a pivotal role in the discovery of therapeutics against various viral diseases and cancers.¹ Despite its significant bioactivity, access to this compound remains challenging due to its natural scarcity and structural complexity. Although chemical and biosynthetic approaches have been investigated, most methods involve lengthy multistep processes or suffer from narrow scopes.^{2,3} Recently, rare sugars and unnatural glycosides have been efficiently synthesized by employing C-H activation strategy; however, these approaches remain predominantly focused on the stereochemical editing of pyranosides.³ Here, we report regioselective structural modification of furanosides by direct C-H activation strategy under mild photocatalytic conditions. This strategy was applied in the synthesis of complex oligosaccharides and nucleosides, exhibiting the potential of this methodology in post-glycosidic modifications.



Acknowledgement

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NHC-Catalyzed Base-Controlled Chemodivergent Synthesis of γ - and δ -Lactone-Fused Uracils

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We report an NHC-catalyzed chemodivergent transformation of 6-methyluracil-5-carbaldehydes with trifluoromethyl ketones, providing selective access to CF₃-substituted γ - and δ -lactone-fused uracils from the same substrates. The key to this transformation is the unprecedented generation of uracil-derived NHC-bound *ortho*-quinodimethane (*o*QDM) intermediates, combined with precise control of the base conditions. Notably, in sharp contrast to previous studies that exclusively afforded six-membered products, our protocol delivers the first entry to synthetically valuable five-membered γ -lactone-fused uracils via a base-controlled relay sequence of NHC-catalyzed [4+2] annulation followed by skeletal rearrangement. These findings expand the scope of NHC-catalyzed vinylogous transformations and open new avenues for the synthesis of novel heterocyclic scaffolds with potential applications in drug discovery.

Lithium Iodide-Mediated Bisfunctionalization of Azabicyclo[1.1.0]butanes with Two Electrophiles

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Azetidines have become privileged scaffolds in modern drug discovery, and azabicyclo[1.1.0]butanes (ABBs) are widely used strained precursors for accessing them. Yet ABB chemistry has so far been dominated by nucleophile–electrophile additions and radical pathways. Here we present a conceptually distinct bis-electrophilic ring-opening of ABBs, triggered simply by lithium iodide. Powered by the strain of the ABB core, the reaction runs under mild, base-free conditions at room temperature and sequentially incorporates two electrophiles to deliver densely substituted azetidines. Mechanistic and control studies assign lithium iodide a central role: it opens the strained C–N bond and generates an enolate intermediate that drives the bisfunctionalization. With broad substrate scope, operational simplicity, and clean compatibility with late-stage functionalization, the method offers a modular platform for rapidly building azetidine-containing molecules.

A Study on the Use of Hydroborated Polyisobutylene as an Initiator for Radical Polymerization

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Organoborane-functionalized polyisobutylene was investigated as a macroinitiator platform for vinyl acetate (VAc) radical polymerization. Hydroborated highly reactive polyisobutylene (HRPB, $M_n \approx 550 \text{ g mol}^{-1}$) was evaluated under different oxygen-supply conditions to clarify the initiation behavior of PIB–borane species. The polymerization outcome was strongly affected by oxygen availability: sealed-air conditions resulted in VAc consumption, whereas oxygen-rich conditions caused rapid monomer consumption but poor effective initiation from PIB chain ends. Significant run-to-run variation further suggested that oxygen diffusion critically influences the activation process.

These observations support the dual role of oxygen in organoborane-mediated radical generation. While oxygen activates borane species to form radicals, excess oxygen can suppress propagation through radical trapping, likely via peroxy species. This behavior is consistent with previous hydroborated-PIB polymerization studies, where low initiation efficiencies were observed under both oxygen-deficient and oxygen-rich conditions.[1]

To reduce the dependence on oxygen diffusion, an oxygen-independent activation strategy was explored. HRPB-derived pinacol boronate was treated with tetrabutylammonium fluoride (TBAF) and a manganese-based oxidant to promote chemical radical generation.[2] However, productive radical polymerization was not achieved, presumably due to incompatibility among the reaction components. Current efforts therefore focus on photocatalytic activation of organoboron species as a milder route to radical generation and polymerization.

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Multistate Phyllantidine–Azobenzene Hybrid Photoswitch with Time-Resolved Orthogonal Controllability

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Molecular photoswitches are specific species capable of undergoing reversible interconversion between distinct structural isomers upon the absorption of light. The conventional photoswitching systems are largely restricted to binary “on/off” logic. Addressing the need for higher density data architectures and complex logic operations, we newly suggested a novel multistate photoswitch based on our developed natural product-inspired molecular photoswitch.¹ This hybrid system transcends the binary paradigm by leveraging time-resolved orthogonality between the two photoactive parts. The azobenzene moiety exhibits fast *E/Z* isomerization on a sub-second timescale, functioning as a volatile transient gate. In contrast, the phyllantidine core undergoes slow photoisomerization providing a state of remarkable thermodynamic stability serving as non-volatile molecular memory. By exploiting these differences between these interconnected pathways, our system establishes a new strategy for developing high-density molecular data storage, demonstrating the transformative potential of natural product-inspired photoresponsive materials.

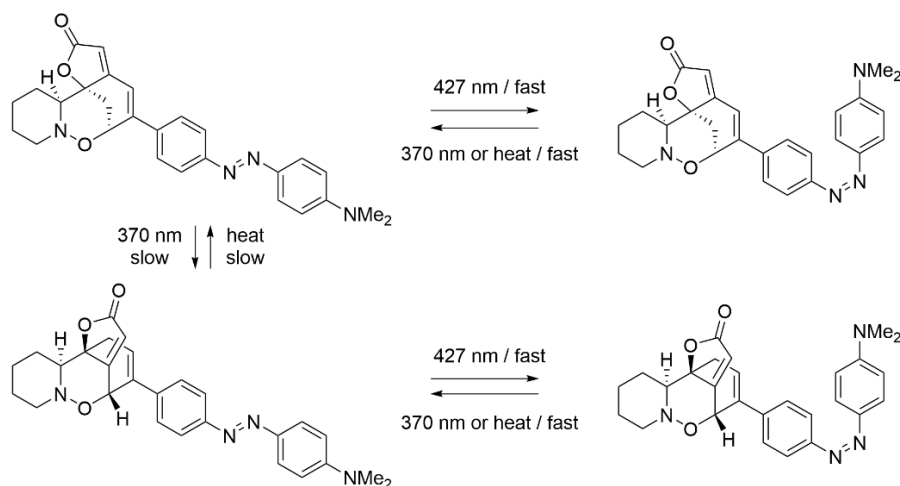


Figure 1. Multistate phyllantidine–azobenzene hybrid photoswitch.

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Development of *N*-heteroaromatics-Based PKM2 Activators for Multiple Sclerosis

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Multiple sclerosis (MS) is a chronic autoimmune disease of the central nervous system characterized by T cell-mediated neuroinflammation and demyelination. Recent studies have highlighted metabolic reprogramming in activated immune cells as a key regulator of autoimmune inflammation. In particular, pyruvate kinase M2 (PKM2), a glycolytic enzyme that can function as either an active tetramer or a less active dimer, has emerged as a promising therapeutic target for controlling inflammatory responses without inducing broad immunosuppression.

In this study, we designed and synthesized a series of *N*-heteroaromatic compounds as novel PKM2 activators for the potential treatment of MS. A molecular docking study was initially performed to guide the rational design of PKM2 activators and to investigate their binding interactions with the PKM2 activator-binding site. Based on the docking results, compounds with favorable binding scores and interactions were synthesized and evaluated in vitro for their PKM2 activation effects.

Several *N*-heteroaromatic compounds exhibited promising PKM2 activation activity, suggesting that this scaffold may effectively modulate PKM2 function. These findings demonstrate the potential of *N*-heteroaromatic compounds as new chemical scaffolds for the development of PKM2-targeting therapeutics and provide a foundation for further lead optimization toward the treatment of multiple sclerosis and related autoimmune inflammatory diseases.

Synthetic Studies Toward Flueggeacosine G

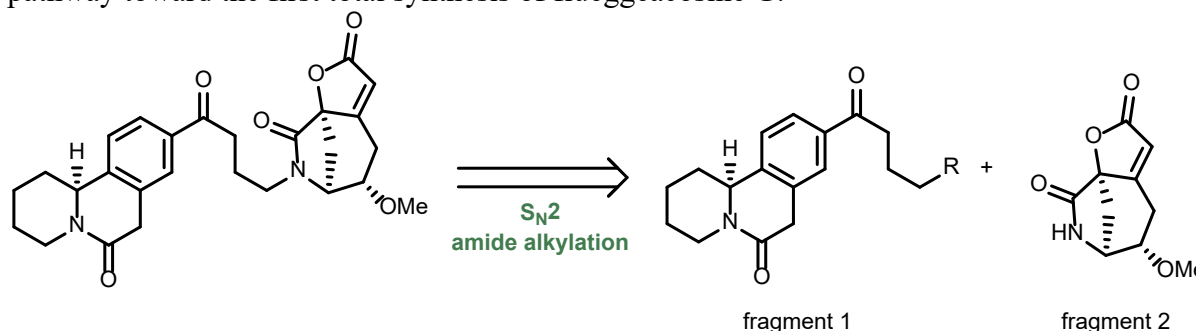
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The securinega alkaloids, isolated from plants such as *Securinega suffruticosa*, have structurally diversified in two main directions: high-oxidation state monomers and high-order oligomers. Flueggeacosines represent a unique class of oxidized high-order securinega alkaloids, combining both structural complexities. While our group previously achieved the total synthesis of flueggeacosines D–F via late-stage C–H functionalization, the synthesis of flueggeacosine G remained elusive due to significant challenges in regioselectivity and undesired side reactions during methoxylation. Specifically, direct decatungstate (TBADT)-mediated methoxylation of flueggeacosine D led to the preferential formation of flueggeacosine E via dehydrogenation, rather than the desired G-type framework. To overcome these limitations, we envisioned a convergent synthetic strategy utilizing fragment coupling to ensure the precise installation of the methoxy group.

Herein, we demonstrate a robust synthetic route to two key building blocks: a tricyclic lactam (Fragment 1) and a methoxy-substituted lactam (Fragment 2). Fragment 1 was prepared from naturally occurring allosecurinine, where the stability was successfully maintained by employing a TBDPS-protecting group. Fragment 2 was synthesized through a sequence involving Julia-Kocienski olefination and a Pauson-Khand reaction, followed by a unique benzoquinone-mediated amidation. The pivotal challenge lies in the late-stage C–N bond formation between these two bulky fragments, as the methoxy-lactam moiety is highly susceptible to base-induced ring opening. To circumvent this instability, we propose four alternative coupling strategies: (1) mild S_N2 conditions using phase-transfer catalysts, (2) enamide formation followed by selective reduction, (3) intermolecular Mitsunobu reaction utilizing the inductive effect of the adjacent lactone, and (4) a BEHT triflate-mediated modified Mitsunobu approach. This convergent methodology provides a promising pathway toward the first total synthesis of flueggeacosine G.



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Keywords: Securinega Alkaloids; Total Synthesis; Fragment Coupling; Mitsunobu Reaction

Metal-Free Conversion of Non-Activated Amides to Esters

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Esters are important functional groups widely used in pharmaceuticals and functional materials[1]. Although numerous methods for ester synthesis have been reported, the direct conversion of amides into esters remains challenging because resonance stabilization imparts partial double-bond character to the amide C–N bond. As a result, conventional methods often require toxic reagents, expensive transition-metal catalysts, or harsh reaction conditions.

In this study, a metal-free method for the conversion of amides into esters was developed. Introduction of a pyridyl group on the amide nitrogen and the use of an acid additive facilitated C–N bond cleavage, providing the corresponding esters efficiently under mild conditions.

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Synthesis of Protocatechuic acid alkyl Ester Derivatives and Comparative Evaluation of Their Hydrophobicity-Dependent Anti-Inflammatory Activities

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Protocatechuic acid (PCA) is a naturally occurring phenolic compound with well-documented antioxidant and anti-inflammatory properties. However, its limited hydrophobicity restricts cellular permeability and consequently reduces its overall bioactivity. To address this limitation, a series of PCA alkyl ester derivatives (PAE-n) with varying alkyl chain lengths were synthesized via Steglich esterification using a range of aliphatic alcohols.

The chemical structures of the synthesized derivatives were confirmed by ^1H NMR spectroscopy. Their anti-inflammatory activities were assessed in TNF- α - and LPS-stimulated HaCaT keratinocytes. The results demonstrated that biological activity was strongly influenced by alkyl chain length. Medium-chain derivatives, including PAE-5, PAE-6, and PAE-7, exhibited markedly enhanced suppression of pro-inflammatory cytokines such as IL-8, IL-6, IL-1 β , and TNF- α compared with native PCA and long-chain ester derivatives.

In contrast, the excessively hydrophobic long-chain derivative PAE-12 displayed increased cytotoxicity and reduced anti-inflammatory activity, indicating that overly high hydrophobicity negatively affects cellular compatibility and viability. These findings highlight the importance of achieving an optimal hydrophobicity balance to maximize intracellular delivery and biological performance.

This study demonstrates that systematic modulation of alkyl chain length can effectively regulate cellular uptake and anti-inflammatory efficacy, providing valuable insights into the structure–activity relationship (SAR) of PCA-based derivatives. Preliminary observations further suggest that longer-chain PCA esters may possess additional bioactivities, including potential anticancer, whitening, and skin-functional effects, indicating their promise as candidates for future cosmeceutical applications.

Overall, this work presents an esterification-based molecular design strategy for tuning the biological properties of natural phenolic scaffolds and underscores their potential as next-generation skin-functional agents

Design and synthesis of SARS-CoV-2 3CL protease inhibitors

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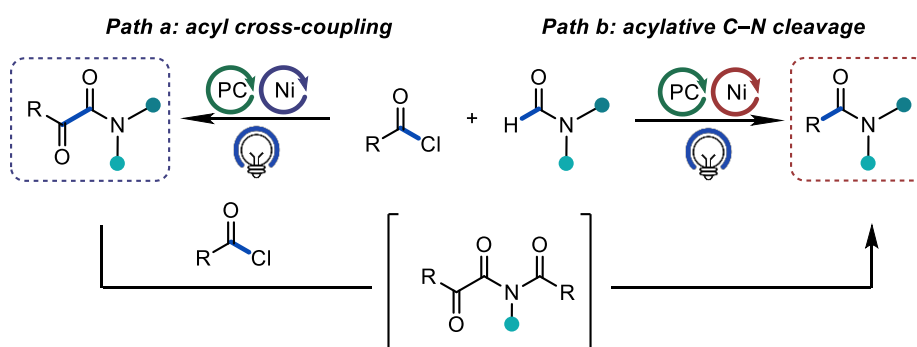
Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has resulted in more than 779 million confirmed cases and 7 million deaths worldwide. Although several therapeutic strategies have been developed, the continuous emergence of viral variants has limited the effectiveness of current treatments, highlighting the need for novel direct-acting antivirals. SARS-CoV-2 3CL protease (3CLpro) is an attractive antiviral target because it plays an essential role in viral replication and has no closely related human protease homolog with the same cleavage specificity. Although the approved 3CLpro inhibitors nirmatrelvir and ensitrelvir have shown significant clinical benefits, resistance-associated mutations, including E166V and M49L, have raised concerns regarding their long-term therapeutic efficacy. In this study, we designed and synthesized a series of novel peptidomimetic covalent inhibitors based on the linear scaffold of PF-00835231, which exhibits a superior resistance profile against the E166V mutant compared with nirmatrelvir. Keeping the γ -lactam moiety at the P1 position and the leucine residue at the P2 position unchanged, systematic optimization of the P3/P4 moieties and the warhead led to the identification of compound 23, which showed potent inhibitory activity against SARS-CoV-2 3CLpro (IC_{50} = 0.019 μ M) and antiviral activity in a cell-based assay (EC_{50} = 0.020 μ M). In addition, compound 23 maintained comparable or improved antiviral activity against resistance-associated variants relative to the wild-type virus. Furthermore, in vitro DMPK and in vivo PK studies were performed to evaluate its drug-like properties, and ongoing studies are focused on improving metabolic stability through structural modification of the P1 and P2 moieties.

Condition-Controlled Divergent Synthesis of α -Ketoamides and Amides from Acyl Chlorides *via* Ni/Photoredox Dual Catalysis

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We report the development of a Ni/photoredox dual catalytic system enabling divergent access to α -ketoamides and α -substituted amides from acyl chlorides and formamides under mild conditions. Mechanistic investigation revealed that these two transformations do not proceed through a simple bifurcation from a common intermediate but instead reflect fundamentally distinct catalytic pathways with opposing stoichiometric requirements. α -Ketoamide formation proceeds via acyl-retentive cross-coupling and is favored when acyl chloride loading is restricted to suppress over-acylation of the product. α -Substituted amide formation, in contrast, follows an unexpected sequential pathway in which the ketoamide generated in the first catalytic event undergoes further acylation at nitrogen with excess acyl chloride, and the resulting acylated ketoamide serves as the operative electrophile for a subsequent Ni/photoredox-catalyzed C(acyl)–N bond activation, liberating the amide product directly. Consistent with this mechanistic proposal, inverting the acyl chloride-to-formamide stoichiometric ratio from 1:2 to 2:1 resulted in a substantial improvement in amide yield. Reaction progress monitoring revealed that acyl chloride is consumed and ketoamide accumulates in the early phase of the reaction, followed by ketoamide erosion concomitant with amide formation, providing kinetic evidence for the sequential nature of the transformation. Control experiments establish that Ni, photocatalyst, and visible light are each essential for amide formation. The divergent selectivity between the two pathways is governed by stoichiometry, base identity, ligand, and temperature, reflecting the distinct mechanistic demands of each catalytic cycle. This work establishes a unified acyl chloride platform for the selective synthesis of two medically important carbonyl motifs and provides a mechanistic framework for understanding condition-dependent pathway divergence in Ni/photoredox catalysis.



Lewis acid-catalyzed asymmetric allylation and Mukaiyama aldol reaction of 1,2-dicarbonyl compounds

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Enantioselective carbon–carbon bond formation to ketones remains a longstanding challenge, owing to their attenuated electrophilicity and limited enantiofacial bias. In this context, 1,2-dicarbonyl compounds represent attractive yet underexplored substrates, as they can provide direct access to highly functionalized chiral tertiary alcohols. Herein, we disclose a unified chiral oxazaborolidinium ion (COBI) catalytic platform that enables both asymmetric allylation and Mukaiyama aldol reactions of 1,2-dicarbonyl compounds. Notably, this work includes the first catalytic asymmetric allylation of 1,2-diketones. The COBI catalysts effectively differentiate two electronically and sterically similar carbonyl groups, delivering chiral tertiary homoallylic alcohols and β -hydroxy ester products in high yields (up to >99%) with high selectivities (up to >99% ee, >20:1 d.r., and >20:1 r.r.). The synthetic value of the products was showcased through concise transformations into dihydropyrans, lactones, and 1,2-diols, as well as streamlined syntheses of bioactive molecules, including (+)-dimethyl citramalate and (+)-aspergillin PZ. Density functional theory calculations further rationalize the origin of the high regio- and stereoselectivity observed in these transformations.

Ligand-Controlled Switching of Selectivity in Nickel-Catalyzed Asymmetric Migratory Cross-Electrophile Coupling

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Nickel-catalyzed cross-electrophile coupling (XEC) has emerged as a powerful strategy for C–C bond formation, enabling the direct coupling of readily available electrophiles while avoiding the use of sensitive organometallic reagents.¹ Despite significant advances in XEC reactions, controlling chemoselectivity and stereoselectivity with unactivated alkyl electrophiles remains a major challenge.

Herein, we report a nickel-catalyzed asymmetric C(sp³)–C(sp²) cross-electrophile coupling of aryl halides with unactivated secondary alkyl halides bearing α -silyl groups under mild reductive conditions.² The developed catalytic system provides alkyl–aryl coupling products in good yields with high enantioselectivity, enabling efficient access to silicon-containing stereogenic centers.

Notably, the ligand environment switches the reaction pathway, leading to divergent outcomes from identical alkyl halide substrates. One ligand promotes direct asymmetric cross-electrophile coupling to afford α -silyl stereogenic products with up to 92% ee, whereas another enables nickel-catalyzed chain walking for remote, site-selective C–C bond formation while maintaining high enantioselectivity. These results highlight ligand-controlled nickel catalysis as a powerful strategy for achieving both enantioselective and site-selective bond formation in asymmetric cross-electrophile coupling.

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Observation of Excited State-Derived Photoluminescence Decay of Organic Sensitizer to Monitor Its Photo-Induced Charge Transfer Efficiency

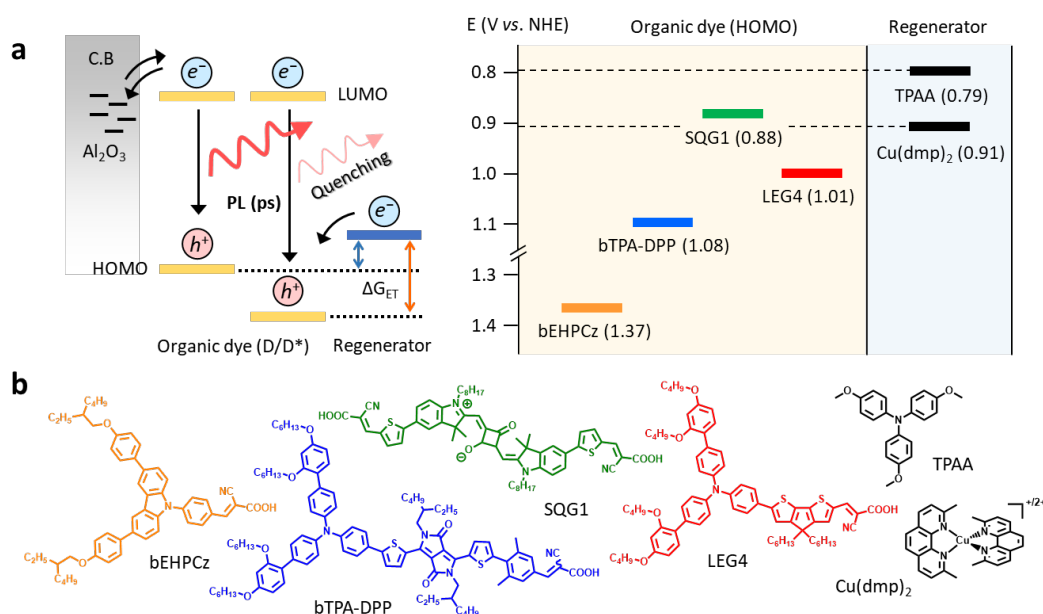
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Photo-induced charge transfer (PCT) is important for developing efficient solar-powered devices, such as photovoltaic and photoelectrochemical cells, because it underlies their operation and determines power conversion efficiency. So far, we have depended strongly on the transient absorption of the objectives to evaluate the PCT between the electron donor and electron acceptor. Thus, we need to expand the approach to understand PCT broadly.

Herein, we suggest the transient photoluminescence-based method to observe PCT between the organic sensitizers and the redox mediator. For this method, we adsorbed various organic compounds onto Al₂O₃ in combination with redox mediators. Charge separation across the excited sensitizer instantaneously induces the oxidized form of the organic sensitizer, and sequentially, the redox mediator delivers electrons to the oxidized sensitizer, resulting in the decay of the photoluminescence lifetime of the organic sensitizer. The photo-luminescence lifetime of the organic sensitizer decreases depending on the Gibbs free energy of charge transfer, which implies the charge transfer efficiency between the organic sensitizer and redox mediator. Our findings suggest an alternative approach to understanding PCT, which is helpful in the view of PCT in photovoltaics, optoelectronics, and photocatalysts.



Harnessing Oxidative Stress and Target Protein Modulation to Overcome Photodynamic Therapy Resistance

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Photodynamic therapy (PDT) can effectively kill cancer cells via oxidative stress but also drive resistance by re-inducing a resistance-linked protein and downstream signaling, especially with repeated treatment.¹⁾ We developed an Iridium photosensitizer, Ir-Lock, that binds this protein to block its re-expression. A non-targeting control (Ir-Free), lacking the binding moiety, was used to distinguish the effects of specific targeting from non-specific oxidative stress.

In vitro and in vivo studies, Ir-Free increased the target protein and related signaling, whereas Ir-Lock suppressed the target protein and associated interactome components. In repeated-PDT models, Ir-Lock removed re-expressed target protein, prevented resistance, and maintained efficacy across cycles. Preliminary in vivo results suggested immune activation, indicating potential synergy with immunotherapy. Overall, this strategy mitigates oxidative stress-driven resistance and supports sustained cancer control.

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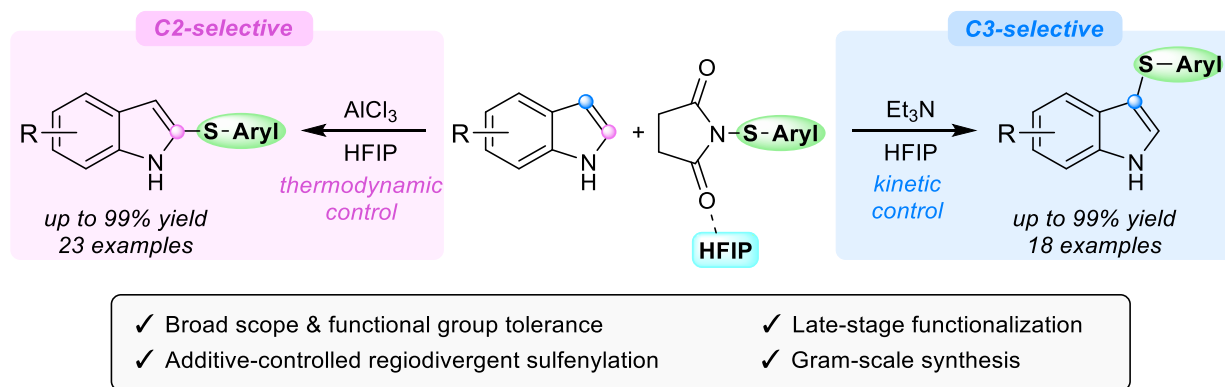
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Additive-Controlled Regiodivergent C-H sulfenylation of Indoles

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An additive-controlled, regiodivergent C–H sulfenylation of indoles has been developed, enabling selective access to either C2- or C3-sulfenylated products. In the presence of catalytic AlCl_3 and *N*-thiosuccinimides, HFIP promotes the formation of the thermodynamically favored C2-isomers by stabilizing reactive intermediates and facilitating an intermolecular C3-to-C2 sulfur-migration. In contrast, under basic conditions, such migration is uppressed, resulting in the selective trapping of the kinetic C3-products. This protocol operates without the need for excess strong Brønsted acids and features broad functional group tolerance, scalability, and applicability to late-stage functionalization of complex bioactive molecules.



Development of fluorescent probes for cathepsin K using reverse design strategies

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Cathepsin K is an enzyme secreted by osteoclasts that breaks down collagen proteins, a major constituent of bone. As such, it plays a critical role in bone resorption and serves as a key biomarker for assessing osteoporosis. Fluorescent probes targeting this enzyme are important tools for the early diagnosis and treatment monitoring of osteoporosis. However, existing peptide-based fluorescent probes often have limitations in improving selectivity due to nonspecific interactions with not only cathepsin K but also to other proteases with similar activity. A reverse-design strategy refers to the development of fluorescent probes based on the structure of a protein-selective inhibitor obtained through structural optimization. One example of this approach involves the design of a fluorescent probe by replacing the active group of a covalent inhibitor with a hydrolyzable structure. In this study, a novel series of fluorescent probe was designed based on a reverse-design strategy to exhibit a turn-on fluorescence response upon reaction with cathepsin K. Among the synthesized compounds, OSCB-CatK-1 demonstrated excellent fluorescence turn-on performance and high selectivity over other cathepsin family enzymes. These results suggest that OSCB-CatK-1 is a promising analytical and diagnostic tool for osteoporosis.

Regiodivergent Styrene-Nitrone [3+2] Cycloaddition via Preferential Styrene Oxidation under Iron(III) Photoredox Catalysis

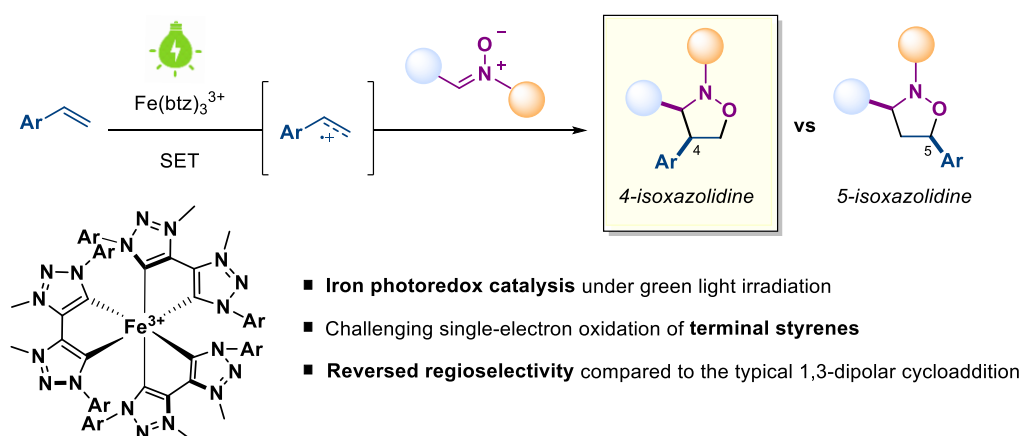
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Although replacing precious-metal photoredox catalysts with earth-abundant alternatives represents a compelling strategy toward sustainable synthesis, such systems are often hampered by short excited-state lifetimes that limit their synthetic utility.¹ To address this challenge, we employ the Fe(III) mesoionic carbene complex $[\text{Fe}(\text{btz})_3]^{3+}$ (btz = 3,3'-dimethyl-1,1'-bis(p-tolyl)-4,4'-bis(1,2,3-triazol-5-ylidene)), which exhibits an unusually long-lived ligand-to-metal charge-transfer (LMCT) excited state and a high excited-state oxidation potential.² These properties enable single-electron oxidation of terminal styrenes under green-light irradiation, generating persistent radical cations that undergo [4+2] cycloaddition with nucleophilic dienes.³

Building on this Fe-photoredox platform, we further extend its application to 1,3-dipolar [3+2] cycloaddition reactions using nitrones as the dipolar partners. Under mild visible-light photoredox conditions, single-electron oxidation of electronically diverse styrene substrates generates the corresponding radical cation intermediates, which react with nitrones to afford 4-arylated isoxazolidine derivatives with high regioselectivity. Notably, the regiochemical outcome of this photoinduced process is opposite to that of the classical thermal [3+2] cycloaddition, highlighting the distinct reactivity profile of the radical cation pathway. Mechanistic investigations, including DFT calculations and transient absorption spectroscopy, are consistent with a photoinduced single-electron transfer (SET) mechanism. Collectively, these results establish Fe(III) mesoionic carbene complexes as viable photocatalysts for highly oxidizing reaction manifolds that have traditionally been accessible only with noble-metal photocatalysts.



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Substituent-Guided Routing in Chemical Reaction Networks

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Metabolism is a complex chemical reaction network (CRN) capable of modulating reaction flux through different pathways in response to changing conditions—a principle that has become important to the design of synthetic, out-of-equilibrium systems. In a chemically driven transient oligoesterification network, we previously showed that subtle structural variations in 4-hydroxybenzoic acid monomers give rise to markedly different dynamic behaviors, revealing strong substituent-dependent control over reaction routing. Here, we show that strongly electron-withdrawing substituents ortho to the hydroxy group act as molecular traffic directors, tuning the nucleophilicity of the hydroxy group to selectively open or suppress specific reaction channels. The results demonstrate that substituent-guided routing not only reshapes network connectivity but also serves as a powerful molecular wiring instruction for designing new synthetic CRNs. By revealing how chemical modification reconfigures network connectivity, this work provides fundamental insight that will enable the rational design of increasingly complex and adaptive synthetic CRNs.

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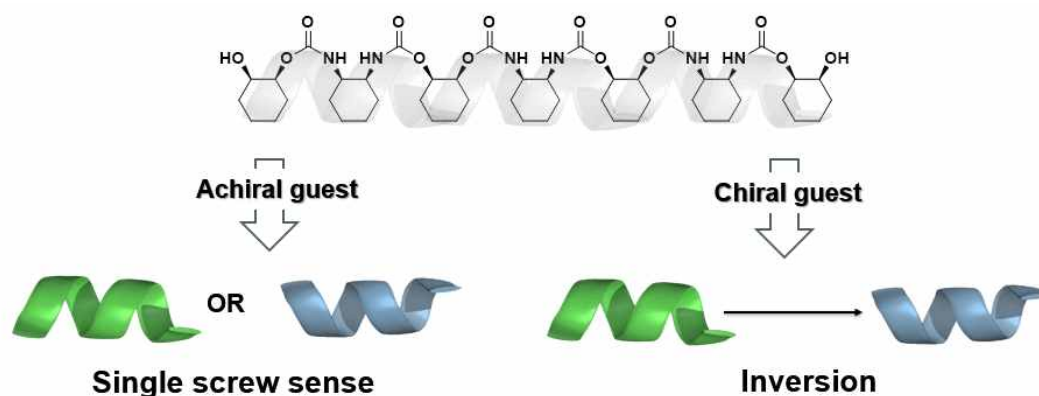
Control of Helical Folding Structures in *meso*-Oligourethanes

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While oligourethane foldamers offer versatile biomimetic platforms, their potential remains underdeveloped compared to structural analogues like oligoureases. In particular, the inherent symmetry and lack of predetermined handedness in *meso*-oligourethanes allow for precise helical control, making them highly promising for applications in stimuli-responsive smart materials.

In this study, heptameric *meso*-oligourethanes were synthesized through selective deprotection and iterative coupling of monomers, with their helical folding dynamically controlled via two distinct strategies. Structural asymmetry was introduced by incorporating hydrogen-bond donor and acceptor groups at the termini, and helical inversion was further achieved through the reconfiguration of the hydrogen-bonding network upon binding with external guest molecules. This two approach facilitated the systematic elucidation of how symmetry breaking dictates global helical directionality.



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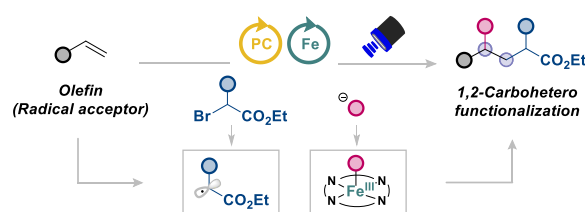
Rapid alkene carboheterofunctionalization enabled by Photoredox/RLT Dual Catalysis

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Difunctionalization of alkenes, which introduces two distinct functional groups across a C=C bond, has emerged as a powerful strategy in modern organic synthesis. Among the various approaches, visible-light photoredox catalysis has attracted considerable attention because it enables these transformations under mild and redox-neutral conditions. A key advantage of photoredox catalysis lies in its ability to activate readily available radical precursors, especially alkyl halides, through single-electron transfer (SET) processes. Owing to their weak C–halogen bonds and facile homolytic cleavage, alkyl halides can efficiently generate carbon-centered radicals that undergo addition to alkenes, providing versatile intermediates for subsequent functionalization. In parallel, radical ligand transfer (RLT) strategies have emerged as an efficient approach for radical functionalization. Recent studies have shown that iron catalysts can effectively transfer pseudohalogens to alkene-derived radicals, highlighting the untapped potential of iron-based RLT processes as sustainable and cost-effective alternatives to conventional methodologies. Herein, we report a dual photoredox/iron-catalyzed 1,2-difunctionalization of alkenes using electron-deficient alkyl bromides as radical precursors. Following radical addition to alkenes under photoredox conditions, the resulting intermediates undergo pseudohalogen transfer through an iron-mediated radical ligand transfer mechanism, affording the desired 1,2-difunctionalized products with high efficiency and selectivity.



Acknowledgement

This work was supported by the National Research Foundation of Korea (NRF) funded by the Ministry of Science and ICT (RS-2023-00218616, RS-2024-00351679, and RS-2025-02263193) and the Ministry of Education (RS-2025-25397599).

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포스터 발표

**Stoichiometry-Controlled Divergent Synthesis of Pyrazolidine-Fused
Tetrahydroquinolines and C3-Functionalized Quinolines via [3+2] Cycloaddition
of C,N-Cyclic Azomethine Imines**

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Quinoline frameworks are important structural motifs found in many biologically active molecules and functional materials. As a result, efficient methods for their synthesis continue to attract significant attention. Herein, we report a stoichiometry-controlled reaction between C,N-cyclic azomethine imines and in-situ generated endocyclic N-silyl enamines. This transformation provides divergent access to either pyrazolidines or C3-functionalized quinolines. C,N-cyclic azomethine imines are generally known to react with electron-deficient dipolarophiles through normal-electron-demand pathways. In contrast, our strategy employs electron-rich N-silyl enamines as dipolarophiles, leading to an unusual reactivity mode. When N-silyl enamines were used in excess, pyrazolidine derivatives were selectively obtained through [3+2] cycloaddition. However, when C,N-cyclic azomethine imines were employed in excess, the reaction pathway changed dramatically. Under these conditions, quinoline derivatives were formed through sequential cycloaddition and rearomatization processes. Mechanistic studies suggested that the reaction initially proceeds through [3+2] cycloaddition to generate a cyclic intermediate. The excess C,N-cyclic azomethine imines then promote oxidative rearomatization to furnish C3-functionalized quinolines. Control experiments and deuterium-labeling studies supported this previously unrecognized oxidative behavior of C,N-cyclic azomethine imines.

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Aggregation-Induced Emission Properties of β -Aminovinyl Sulfides

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β -Aminovinyl sulfides, characterized by the incorporation of sulfur and nitrogen substituents, were synthesized through regio- and stereoselective hydrothiolation of ynarnides. Subsequently, these compounds were investigated for their aggregation-induced emission (AIE) properties. Notably, several tetrasubstituted alkenes demonstrated pronounced solid-state fluorescence and significantly enhanced photoluminescence when aggregated in THF/H₂O mixtures. Comprehensive photophysical analyses, including assessments of α AIE phenomena, fluorescence lifetimes, and quantum yields, provided insights into structure-property relationships that depend on alkene geometry and the nature of heteroatom substitution. These findings establish β -aminovinyl sulfides as a promising class of AIE-active frameworks and underscore the potential of sulfur-containing alkenes as advanced functional luminescent materials.

Total Synthesis of Herpotrichones and Structure Modification Toward Anti-Neuroinflammatory Activity

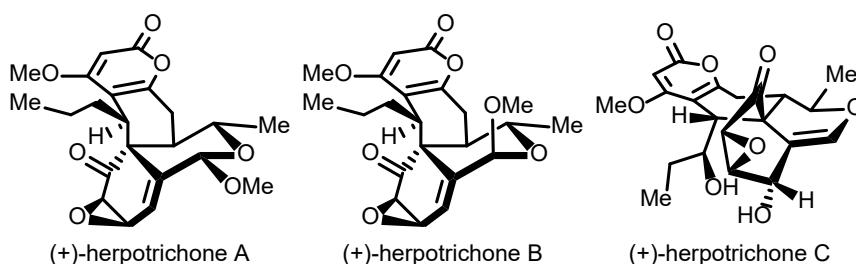
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Herpotrichones are a class of bioactive natural products exhibiting anti-neuroinflammatory activity.⁽¹⁾ Previous studies have reported that herpotrichones A and B display higher activity than herpotrichone C, suggesting that specific structural features are important for biological function.⁽²⁾ Herein, we accomplished the total synthesis of herpotrichones A–C, which provided a platform for the preparation of structurally modified analogues.⁽³⁾ Based on these observations, we sought to improve the activity of herpotrichone C through structural modification. By incorporating key structural elements found in the more active analogues, we designed and synthesized modified derivatives of herpotrichone C. These compounds exhibited enhanced anti-neuroinflammatory activity relative to the parent compound, partially restoring biological activity.



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Engineering a Photosensitizer for Precision Modulation of Biomolecular Condensates

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ABSTRACT

Conventional chemotherapy drugs are often non-specific and highly toxic, leading to severe side effects. To address these limitations, targeted cancer therapies have been actively studied, focusing on specific genes, proteins, and signaling pathways known to drive tumorigenesis. Recent studies have demonstrated that certain biomolecular condensates play crucial roles in cancer cell initiation and progression, and their association with drug resistance has also been reported. Consequently, the study of these condensates as therapeutic targets has gained increasing importance. Biomolecular condensates are membraneless organelles formed via liquid–liquid phase separation (LLPS) driven by weak multivalent interactions, which makes them challenging to target using conventional inhibitor-based approaches.

In this study, we designed and synthesized an iridium-based photosensitizer capable of targeting biomolecular condensates. The photosensitizer enables the spatiotemporal generation of reactive oxygen species (ROS) upon light irradiation. By controlling light intensity, the oxidative stress induced by these ROS can be regulated, allowing for diverse condensate transformations in a precise manner. This system presents a novel approach to modulating condensate dynamics.

In conclusion, this study aims to investigate the subsequent changes in cancer cells induced by condensate modifications, potentially broadening the application of this study as a novel target strategy of therapeutics.

A de novo synthetic study towards lipoarabinomannan

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Phosphatidylinositol-mannosides (PIMs), lipomannan (LM), and lipoarabinomannan (LAM) are major polysaccharides in the cell envelope of *Mycobacterium tuberculosis* (*Mtb*), the causative agent of tuberculosis, and play essential biological roles in the cell envelope.¹ Structurally, *myo*-inositol in PIMs consists of glycerophospholipid at O1 and mannosyl group at O2 and O6. We report a convergent synthetic strategy that uses PIM₂ as a key intermediate to access LM and miniature LAM analogues, enabling efficient assembly of linear and branched mannan and arabinan motifs under mild, acid-free glycosylation conditions.² Our synthetic strategy minimizes protecting-group manipulations and partitions the target into three convergent fragments: a protected *myo*-inositol phosphate bearing diacyl glycerol anchors, a linear and branched mannan allene fragment, and arabinan fragments. This approach offers a valuable strategy for synthesizing complex oligosaccharide and potential immunological studies.

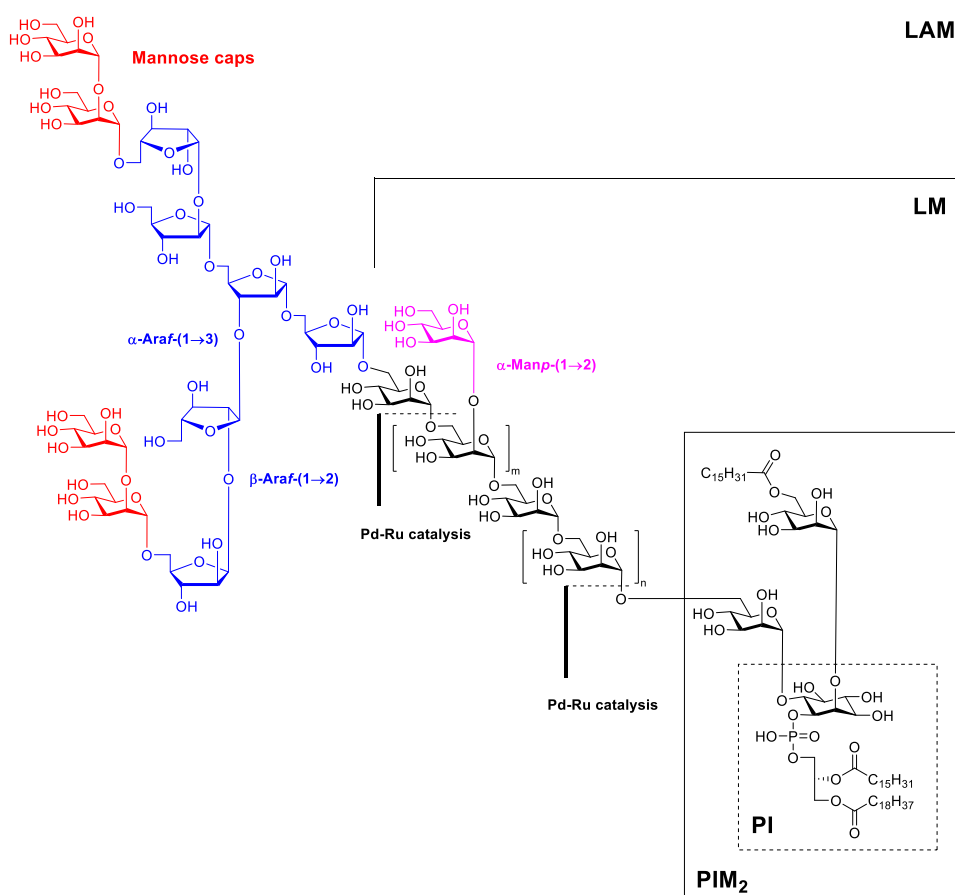


Figure 1. Structure of phosphatidylinositol dimannosides (PIM₂), lipomannan (LM) and lipoarabinomannan (LAM)

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Asymmetric S_N1 Catalysis of Tertiary Carbenium Ions for Stereoconvergent Construction of All-Carbon Quaternary Stereocenters

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Tertiary carbocations are powerful intermediates for constructing congested carbon frameworks, yet their use in catalytic asymmetric synthesis remains challenging because of their high reactivity, planar geometry, and propensity for elimination or rearrangement. We have developed a stereoconvergent S_N1-type catalytic strategy that transforms racemic tertiary alcohols into chiral Lewis acid-associated tertiary carbenium ion complexes. In the presence of confined chiral oxazaborolidinium ion catalysts, these intermediates undergo highly enantioselective C–C bond formation with heteroarenes to furnish acyclic all-carbon quaternary stereocenters. The reaction proceeds across a broad range of substrates, delivering products in up to 99% yield and 99% *ee*, and is applicable to gram-scale synthesis and rapid access to bioactive triarylalkane structures. Mechanistic experiments, kinetic isotope effect studies, and DFT calculations indicate that stereocontrol arises from tight substrate–catalyst association and stabilizing CH– π interactions inside the chiral catalyst pocket. In addition, elimination-derived alkenes can re-enter the catalytic cycle through carbenium ion formation, accounting for the stereoconvergent nature of the process. Extension to silane-mediated C–H bond formation further demonstrates the generality of catalyst-associated tertiary carbenium ions as platforms for asymmetric functionalization of racemic sp³ precursors.

Acid based catalytic strategy to upcycle Polylactic acid: Synthesis of 1,3-dioxolan-4-ones

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The excessive use of plastics has increased dependence on fossil fuels, leading to growing interest in recycling research for plastics. However, Polylactic acid (PLA), which is well known as biodegradable plastic, suffers from poor biodegradability due to its crystallinity and also exhibits low thermal stability. To address these limitations, we investigated the conversion of PLA into high-value-added chemicals.

Through an acid-catalyzed co-upcycling reaction of PLA with another polymer Polyoxymethylene (POM) enabled the synthesis of the compound 1,3-dioxolan-4-one (DOX). High yields of DOX derivatives were obtained even when using substrates containing various functional groups. Mechanistic studies revealed the effects of both presence of water and POM on the reaction. Finally, copolymerization of DOX with lactide afforded a new polymer, PLLA-DOX, which exhibited superior properties compared to origin PLA.

The strategy developed in this study can also be applied to impure or colored plastic PLA samples, thereby avoiding common issues encountered in plastic recycling processes. In addition, the product, DOX offers further advantages because it can serve various roles, such as a green solvent or monomer of Poly- α -hydroxy acid (PHA). Overall, this study is significant not only because it converts PLA into high-value-added chemicals, but also because it provides a superior polymer with enhanced performance compared to PLA.

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**Stereocontrolled Assembly of Tetrahydrofurans via Chiral
Oxazaborolidinium Ion–Catalyzed Formal [3+2] Cycloaddition of
Allylsilanes and Aryl Glyoxals**

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An enantioselective synthesis of cis-2,5-disubstituted tetrahydrofuran-3-ones has been developed through a formal [3+2] cycloaddition of allylsilanes under chiral oxazaborolidinium ion (COBI) catalysis. The transformation is initiated by nucleophilic addition of the allylsilane to the activated carbonyl substrate, followed by intramolecular cyclization and a subsequent 1,2-hydride migration to furnish the tetrahydrofuran framework. Under the optimized conditions, a range of tetrahydrofuran-3-one derivatives were obtained in good to high yields with excellent stereoselectivities, reaching up to 88% yield, 99% ee, and >20:1 dr. Notably, this catalytic system enables the asymmetric construction of cis-2,5-disubstituted tetrahydrofuran-3-ones from achiral starting materials while simultaneously establishing up to four stereogenic centers in a single operation. This method provides an efficient and highly stereoselective approach to densely functionalized tetrahydrofuran scaffolds.

Ascorbate-Mediated GLUT1 Targeting and Redox Perturbation Enhance Photodynamic Therapy in Cancer

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Glucose transporter 1 (GLUT1), which is frequently overexpressed in cancer cells, represents a metabolically relevant target associated with the heightened glucose demand of malignant tumors and can therefore be leveraged for selective drug delivery. In this study, we designed an ascorbate-based photosensitizing probe that targets GLUT1. In particular, ascorbate is transformed into a dehydroascorbic acid (DHA)-like form under oxidative tumor environments, thereby promoting GLUT1-mediated cellular internalization. Subsequent intracellular reduction consumes glutathione (GSH), perturbs redox homeostasis, and consequently primes cancer cells for enhanced susceptibility to PDT-induced oxidative damage. Notably, the probe exhibited preferential accumulation in the GLUT1-high colorectal cancer cell line KM12C, accompanied by elevated reactive oxygen species (ROS) levels, GSH depletion, suppression of colony formation, and induction of apoptosis, collectively resulting in enhanced phototoxicity. Moreover, in xenograft models, this strategy produced significant tumor growth inhibition with minimal systemic toxicity. Therefore, harnessing ascorbate as both a GLUT1-targeting moiety and a redox-perturbing sensitizer represents a promising strategy for enhancing PDT efficacy in GLUT1-overexpressing tumors.

Regioselective Construction of All-Carbon Quaternary Centers via Allene Hydroalumination/Allylation

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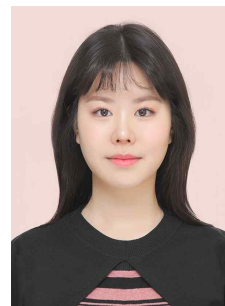
The formation of all-carbon quaternary centers remains a central challenge in organic synthesis because of severe steric congestion and the difficulty of controlling regioselective carbon–carbon bond formation. In this study, we present a hydroalumination-enabled strategy for the efficient construction of quaternary carbon centers from readily accessible allene substrates. Copper-catalyzed hydroalumination of di- and trisubstituted allenes with diisobutylaluminum hydride generates allylaluminum intermediates in situ, which subsequently undergo selective allylation with electrophilic reaction partners.

This approach enables the formation of highly functionalized carbon skeletons under mild conditions with excellent regioselectivity. By incorporating diverse electrophiles, including cyanating reagents, isocyanates, and iminium salts, this platform provides access to homoallylic nitriles, amides and homoallylic amines bearing all-carbon quaternary centers. The synthetic utility of this method is further demonstrated through gram-scale reactions and downstream transformations to valuable nitrogen-containing molecules. These results highlight hydroalumination-based allylaluminum chemistry as a modular and practical platform for quaternary carbon center formation.

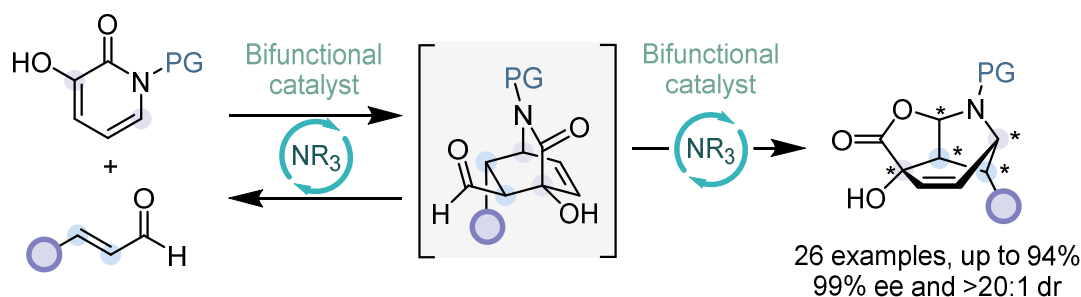
Enantioselective Organocatalytic One Pot Construction of Normorphan Skeleton: Total Synthesis of (+)-Peduncularine

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A bridged tricyclic scaffold with a sp³-rich framework offers a versatile core structure for the design of bioactive molecules that resemble those found in numerous natural products with notable biological activities. This scaffold faces key challenges in medium-sized ring synthesis, such as poor site selectivity and stereoselectivity and competing reaction pathways, which are prevalent in current synthetic methods. Here, we describe a highly efficient and one pot method for constructing a N-bridged tricyclic scaffold bearing normorphan skeleton using a bifunctional cinchona alkaloid-derived squaramide catalyst. The reaction between 3-hydroxy-2-pyridones and α,β -unsaturated aldehydes results in the formation of a [4+2] cycloaddition adduct as an intermediate. The catalyst directs both enantioselectivity and diastereoselectivity in the initial cycloaddition step through bifunctional hydrogen-bond donor/base activation, and subsequently facilitates the rearrangement process as a Brønsted base and hydrogen-bond donor, driving the formation of the N-tricyclic compound in a one-pot reaction. This methodology provides a versatile approach for accessing various bridged normorphan skeleton that exhibit excellent enantio- and diastereoselectivities (up to 99% ee and dr > 20:1). The protocol is scalable to gram quantities and was successfully applied for the first total synthesis of the enantiomer of the alkaloid, (–)-peduncularine and the preparation of analogous derivatives, which highlights the method's utility in the synthesis of complex, enantioenriched normorphan natural product derivatives.



- Rigid sp³-bridged nitrogen tricycle
- Stereoselective metal-free organocatalysis
- Ambient, aerobic conditions
- Intermolecular cycloaddition & rearrangement
- 5 Stereocenters in one step
- Asymmetric total synthesis

Acknowledgement

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Toward the Total Synthesis of Verrucarin A

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Verrucarin A is a representative member of the macrocyclic trichothecenes, a family of sesquiterpenoid fungal secondary metabolites. Verrucarin A was first isolated by the Härr, Loeffler, Sigg, Stähelin, and Tamm's group in 1962 from the fungi, *Myrothecium verrucaria*.¹ Structurally, it possesses a macrocyclic diester linked to the fused tricyclic core verrucarol. Despite its potent biological activities, the structural complexity of verrucarin A has rendered its total synthesis a formidable challenge, with only a limited number of total syntheses reported to date. Herein, we are aiming to elucidate its complete structure via total synthesis. In this presentation, our current research progress on the total synthesis of verrucarin A will be presented. Our synthetic route features a [4+2] cycloaddition-based construction of verrucarol and a sequential esterification strategy for macrocyclic diester assembly and coupling to the verrucarol core.

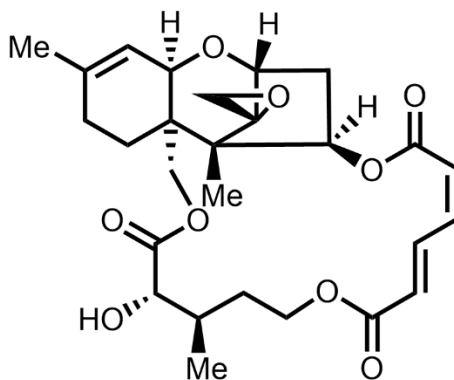


Figure 1 Structure of verrucarin A

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Elucidating the Luminescence Mechanism of a BN-Embedded Scaffold

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Boron–nitrogen (BN) incorporation into π -conjugated systems represents a unique strategy for modulating molecular properties while retaining the structural framework of conventional carbon-based analogues, owing to the isoelectronic and isosteric relationship between BN units and carbon–carbon bonds. Unlike electronically homogeneous CC bonds, BN bonds are intrinsically polarized, leading to pronounced changes in molecular polarity, hydrogen-bonding ability, and electron distribution. Herein, we report a BN-embedded scaffold exhibiting unusual luminescence behavior and explore its luminescence mechanism in detail. Through mechanistic investigation, we seek to establish a rational basis for controlling the luminescence of the BN-embedded scaffold. Beyond the development of a new luminophore, this work suggests a broader molecular design strategy for imparting diverse functionalities to existing fluorophore platforms through CC-to-BN substitution.

On-DNA Synthesis of γ -Ketonitriles for DNA-Encoded Library Construction

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DNA-encoded library (DEL) technology has emerged as a powerful platform in modern drug discovery, enabling the rapid generation and screening of vast collections of small molecules in a highly efficient and cost-effective manner. In DEL systems, each library member is conjugated to a unique DNA barcode that records its synthetic history, allowing active compounds to be identified through sequencing after target-based selection.

Herein, we report DNA-compatible aldol condensation and Michael addition methodologies for the synthesis of γ -ketonitrile scaffolds. These motifs are widely recognized as valuable pharmacophores and versatile synthetic intermediates in medicinal chemistry. In addition, the nitrile functionality provides further opportunities for post-synthetic diversification and scaffold elaboration, thereby enhancing the utility of these compounds in DEL-based lead discovery and optimization.

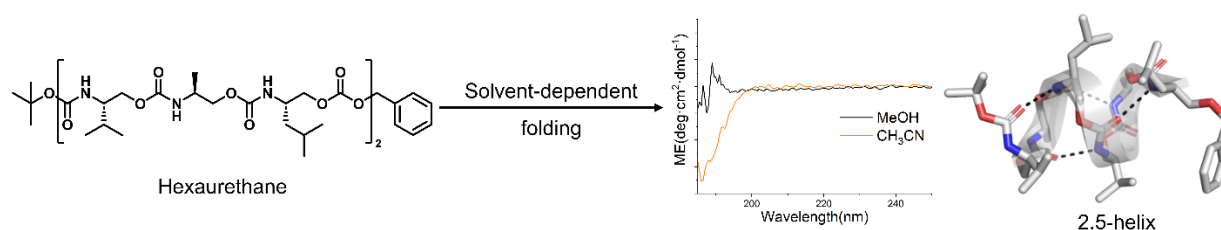
Solvatomorphic Behavior of a Sequence-defined *O*, *N*-Linked Hexaurethane Helix

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Peptidomimetic helices are synthetic molecules copying the structure and function of natural α -peptide helices.^[1, 2] Among them, sequence-defined *O*, *N*-linked oligourethanes represent a promising class for medicine,^[3, 4] although studies on their secondary structures remain limited.^[5] Here, we present synthesis and structural characterization of a hydrophobic *O*, *N*-linked hexaurethane consisting of proteinogenic acyclic side chains. X-ray crystallography revealed that the hexaurethane folds into 2.5-helix resembling its analogue, *N*, *N*'-linked oligoureas. Further analyses using CD and NMR support helical structure, notably solvatomorphic behavior. These results, together with further studies on various structural parameters, will provide design principles for oligourethane helices.



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Protonation-Activated Thiocarbonylated Coumarin Enables Hypoxia-Tolerant Type I Photodynamic Therapy

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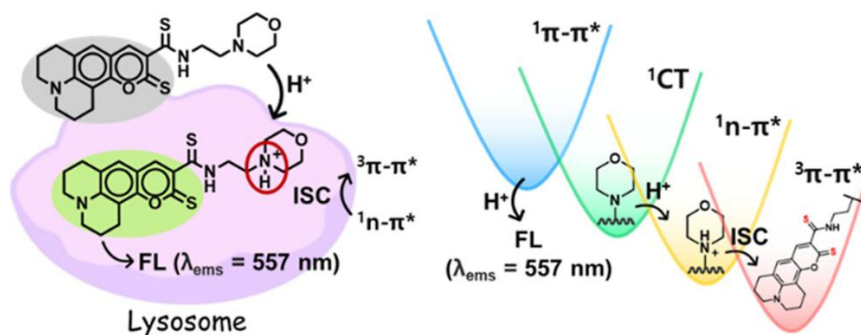
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Photodynamic therapy (PDT) is often limited in hypoxic tumor microenvironments due to its reliance on singlet oxygen generation via Type II pathways. Type I PDT provides an oxygen-independent alternative; however, many current strategies rely on heavy atoms or metal complexes to enhance intersystem crossing (ISC), which can increase toxicity and synthetic complexity. In addition, pH-responsive systems often require strongly acidic conditions, restricting their effectiveness in the mildly acidic tumor microenvironment (TME, pH 6.5–6.8).

Here, This study present a thiocarbonylated coumarin (CS) functionalized with a morpholine unit that enables protonation-controlled excited-state switching. Protonation suppresses charge-transfer character and induces a transition of the lowest excited state from CT to $n-\pi^*$, leading to enhanced spin-orbit coupling and a reduced singlet-triplet energy gap, which together facilitate efficient ISC without heavy atoms.

Consequently, CS generates oxygen-independent reactive oxygen species ($O_2^{\bullet-}$ and $\bullet OH$) under both normoxic and hypoxic conditions. CS is nearly non-emissive at neutral pH but becomes strongly fluorescent upon protonation, enabling selective activation in acidic environments. These results highlight excited-state switching as an effective metal-free molecular design strategy for simultaneously controlling fluorescence and Type I ROS generation, offering a promising approach for hypoxia-tolerant PDT.



Scheme 1. Protonation-driven CT $\rightarrow$ $n-\pi^*$ excited-state switching enhances ISC and fluorescence.

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Enhanced Photodegradation of Microplastics by Sulfate Radicals Under Low Oxygen Condition

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The presenter's name : Hyeongho Jo

The presentation title : Enhanced Photodegradation of Microplastics by Sulfate Radicals Under Low Oxygen Condition

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Microplastic pollution poses a serious threat to ecosystems and human health, demanding efficient and practical degradation strategies. Sulfate radical-based advanced oxidation processes (SR-AOPs) are promising; however, their efficiency is often limited by the conversion of sulfate radicals ($\text{SO}_4^{\cdot-}$) into less reactive species in the presence of dissolved oxygen.

In this work, we present a simple and effective strategy for microplastic degradation using UV-activated ammonium persulfate (APS) under low O_2 conditions. By continuously purging the system with N_2 , the conversion of $\text{SO}_4^{\cdot-}$ to less reactive radicals is suppressed, thereby maintaining high oxidative activity.

The proposed system effectively degraded various microplastics, including PS, PP, PET, and PVC. Notably, degradation efficiencies exceeded 60% within 60 minutes under low O_2 conditions, and the pseudo-first-order rate constant was approximately four times higher than that under normal O_2 conditions.

This study demonstrates a simple yet efficient approach to enhance radical-based degradation processes and provides insights into controlling reactive species for microplastic remediation.

Catalytic C(sp²)–SuFEx Coupling Enabled by Weakly Coordinating Anion-Based Silylium Lewis Acids

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Sulfur–fluoride exchange (SuFEx) chemistry has emerged as a powerful next-generation click platform in diverse chemical synthesis. However, catalytic C(sp²)–SuFEx coupling of sulfonyl fluorides with unactivated arenes remains underdeveloped. Herein, we report a silylium Lewis acid-catalyzed C(sp²)–SuFEx reaction between sulfonyl fluorides and simple arenes. An active silylium ion pair, generated in situ from trityl tetrakis(pentafluorophenyl)borate and phenylsilane, efficiently activates the S–F bond under transition-metal-, additive-, and solvent-free conditions. Various β -aryl ethenesulfonyl fluorides and aryl sulfonyl fluorides react with arenes and heteroarenes to afford vinyl sulfones and diaryl sulfones in good to excellent yields. Gram-scale synthesis and applications to poly(thioether sulfone) and OLED-related materials highlight the synthetic utility of the method. Mechanistic studies support a pathway involving silylium-mediated S–F activation and electrophilic aromatic substitution via a Wheland-type intermediate. This work expands the scope of C–SuFEx chemistry and provides a practical route to sulfone-containing functional molecules.[1]

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Reconsidering the Antiaromaticity of Cyclopent[hi]aceanthrylene as an Electron Acceptor

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To achieve rational design of organic electron acceptors, a detailed understanding of their electronic structures is essential. Cyclopent[hi]aceanthrylene (CPA) has been widely regarded as an antiaromatic compound and considered a good electron acceptor due to aromatic stabilization upon reduction. However, the resonance structures responsible for this antiaromatic character involve formal charge separation, raising questions about their contribution to the overall electronic structure.

In this study, quantitative aromaticity analyses (HOMA, NICS, and ACID) are used to examine whether CPA can be classified as an antiaromatic compound, indicating that antiaromatic character plays a minor role and that CPA is better described as an aromatic anthracene core fused with a nonaromatic pentagonal ring. Furthermore, this work aims to elucidate the origin of CPA's electron-accepting behavior and enable broader utilization of CPA-based molecular units.

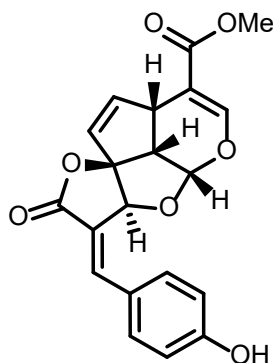
Toward the Synthesis of Prismatomerin

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Iridoids represent a prominent family of monoterpenoids characterized by a highly oxygenated cyclopentanopyran skeleton. Among them, prismatomerin, isolated from the leaves of *Prismatomeris tetrandra*,^[1] represents a particularly challenging synthetic target due to its densely functionalized tricyclic core, contiguous stereocenters, and acid-sensitive ether moiety. It has been reported to exhibit potent cytotoxicity against leukemia cell lines and antitumor activity against mammalian cancer cells.^{[2][3]} Herein, we report our comprehensive efforts toward the synthesis of prismatomerin through two strategic pathways: a total-synthetic route from L-malic acid and L-arabinose, and a semisynthetic route from genipin.



prismatomerin

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Ir(triNHC)-Catalyzed Waste Polyester Upcycling to α -Hydroxy Acids

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Abstract

Recently, environmental and waste-management issues caused by the continuous increase in plastic waste have emerged as major global concerns. In particular, plastics such as polyethylene terephthalate (PET) require the development of effective resource-circulation technologies due to their high consumption and low recycling efficiency. In this study, we proposed an upcycling strategy for converting waste plastics into value-added chemicals using a transition-metal catalyst. For this purpose, an Ir(triNHC) catalyst containing an iridium metal center coordinated with a triNHC ligand was synthesized and employed. Building on this work, the present study investigated the dehydrogenation reactions between PET and various alcohols, successfully enabling the conversion into a range of α -hydroxy acids. Furthermore, the catalytic system was not limited to PET but was also applicable to PLA, PEA, PES which was likewise successfully converted into α -hydroxy acids. Finally, commercially used plastic products were also successfully converted into α -hydroxy acids. These results demonstrate the potential of converting waste plastics into value-added chemicals beyond simple recycling and highlight the promise of this strategy for sustainable plastic resource circulation.

Synthesis of a New BIT-Based FRIPS-MS Tag for Peptide Sequencing

Yeonju Choi and Bongjin Moon*

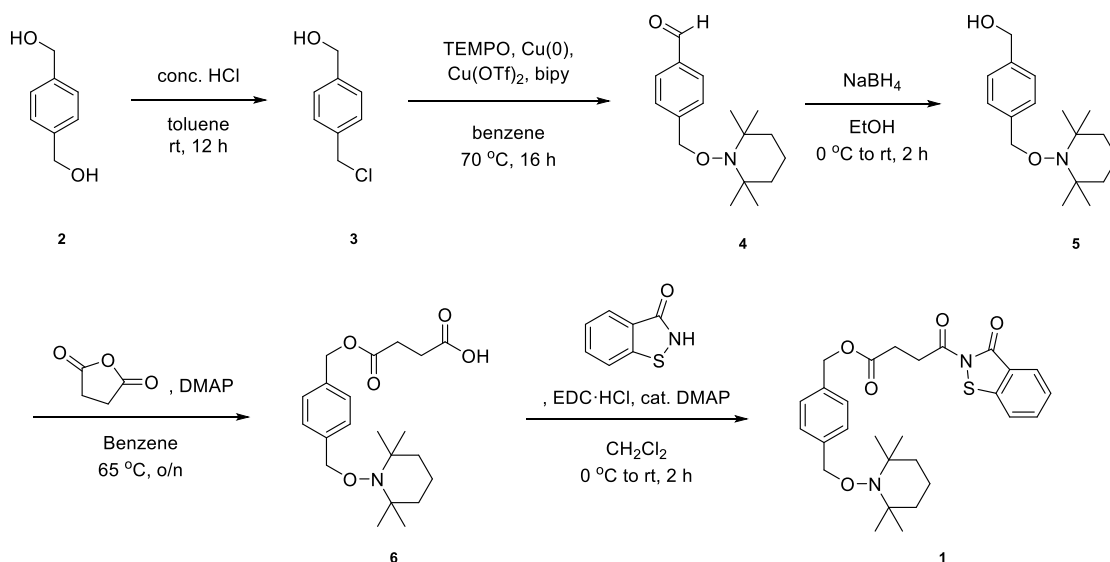
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Free Radical Initiated Peptide Sequencing (FRIPS) is a powerful analytical technique for peptide characterization. While TEMPO-based FRIPS tags have continuously evolved, and *N*-hydroxysuccinimide (NHS) ester TEMPO-based tags have emerged as a relatively recent advancement, these systems still suffer from critical limitations, including rapid hydrolysis and low solubility in aqueous environments. [1]

To overcome these challenges, this study reports the design and synthesis of a novel benzisothiazolinone (BIT)-functionalized TEMPO-based FRIPS tag (**1**), exploiting the outstanding reactivity and high selectivity of the BIT moiety toward amines. [2]

The desired tag (**1**) has been successfully synthesized in 5 steps starting from diol **2** (Scheme 1). In due course, comparative evaluations against the recent NHS ester FRIPS tags will be conducted, focusing on peptide conjugation efficiency, hydrolysis rates, and solubility profiles to determine the new tag's feasibility.



Scheme 1

Reference

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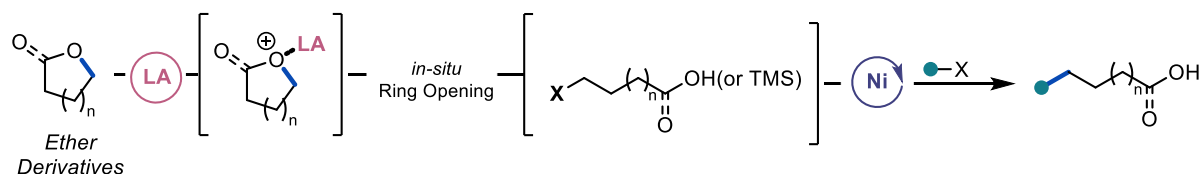
Ni-Catalyzed Cross-Electrophile Coupling of Unstrained Cyclic Ethers and Lactones via in situ Alkyl Iodide Formation

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We report a Ni-catalyzed cross-electrophile coupling of unstrained cyclic ethers and lactones with aryl halides enabled by Lewis acid-mediated C–O bond activation. In contrast to previous approaches relying on strained or preactivated substrates, this method directly utilizes non-activated cyclic ethers lacking ring strain as latent alkyl electrophiles. Treatment with trimethylsilyl iodide (TMSI) generates alkyl iodide intermediates in situ through selective ring opening, which subsequently undergo Ni-catalyzed C(sp³)–C(sp²) bond formation with aryl halides. The method provides modular access to alkyl arene products bearing terminal alcohol functionalities under reductive coupling conditions. Broad substrate scope is demonstrated across various cyclic ethers and aryl halides. Furthermore, extension to lactone substrates enables selective cleavage of the C(sp³)–O bond instead of conventional carbonyl-centered reactivity, furnishing carboxylic acid-containing products through an unconventional lactone activation pathway. Mechanistic studies suggest that iodide-assisted ring opening plays a crucial role in generating reactive alkyl electrophiles, while nickel catalysis mediates the subsequent cross-electrophile coupling process. This work highlights the potential of abundant cyclic ethers and lactones as unconventional electrophile precursors for reductive cross-coupling chemistry.



- ✓ Latent electrophile strategy from simple ethers (THF) without prefunctionalization
- ✓ Direct C–O bond activation of unactivated, unstrained ethers and lactones
- ✓ In situ alkyl iodide generation enabling cross-electrophile coupling
- ✓ One-step C(sp³)–C(sp²) bond formation with alcohol/carboxylic acid installation
- ✓ High step economy under mild, operationally simple conditions

Direct Amide Formation from Ester Substrates via C–O Bond Cleavage

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Ester bond activation provides a useful approach for the synthesis and modification of biologically and pharmaceutically relevant molecules. In our previous work, ester C–O bond cleavage was achieved through oxidative dearomatization using a hypervalent iodine(III) reagent. Based on this background, we developed an activation strategy for ester substrates bearing a suitable activation element. The present system enables ester C–O bond cleavage and subsequent conversion into amide products through a one-pot acyl substitution process. These results demonstrate that ester substrates containing an appropriate activation element can be used for direct amide formation via selective ester bond activation.

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포스터 발표

O-Trapping-Enabled Reactivity Switching of Triazole-Derived α -Imino Carbenoids in Rh(II)/Pd(0) Dual Catalysis

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Rh-catalyzed transformations of *N*-sulfonyl-1,2,3-triazoles provide a valuable platform for generating α -imino metal carbenoids in nitrogen-containing heterocycle synthesis.^[1] Despite extensive studies on their carbene-centered reactivity, strategies that redirect their electrophilicity toward the imine moiety remain underdeveloped.^[2] Herein, we describe a reaction of *N*-sulfonyl-1,2,3-triazoles with vinyl oxazolidinones that exploits carbene-to-imine electrophilicity switching for heterocycle synthesis. The reaction is proposed to involve *O*-trapping of the Rh-carbenoid, followed by annulation with a π -allylpalladium-based *N,C*-dipolar intermediate generated from vinyl oxazolidinones. This study demonstrates a reactivity-switching strategy in triazole-derived carbenoid chemistry.

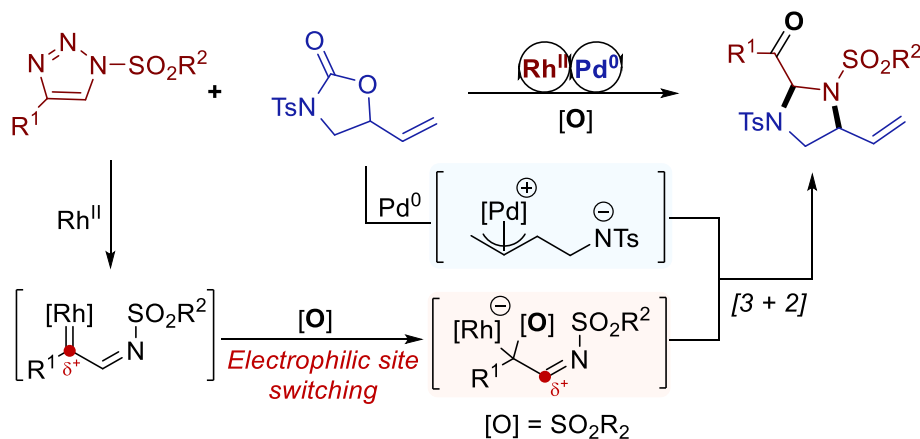


Figure 1

Reference

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포스터 발표

Stereoselective Synthesis of (*E*)-Alkenyl Sulfones via Regioselective Epoxide Ring Opening Enabled by *In Situ* Generated Sulfinates

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Conjugated alkenyl sulfones are valuable motifs in organic synthesis and medicinal chemistry, serving as electron-deficient alkenes, Michael acceptors, and versatile intermediates for further functionalization.^{1,2} Although several methods have been developed for their synthesis, selective access to stereodefined (*E*)-alkenyl sulfones from epoxides remains challenging because competing regioisomeric pathways can lead to mixtures of 1,1-disubstituted alkenes and (*E*)-alkenyl sulfones.³ Herein, we report a regio- and stereoselective synthesis of (*E*)-alkenyl sulfones from aryl and alkyl pyrimidylsulfones and epoxides. Pyrimidylsulfones act as bench-stable latent sulfinates,⁴ and the DMAP/ZnBr₂ system enables *in situ* sulfinate generation, controlled epoxide opening, and *E*-selective elimination. This process affords (*E*)-alkenyl sulfones exclusively, without detectable formation of the corresponding 1,1-disubstituted alkenes or *Z*-isomers. This method provides a practical epoxide-based approach to stereodefined alkenyl sulfones and highlights the utility of pyrimidylsulfones as latent sulfinates in selective C–S bond-forming processes.

Reference

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CO₂-Derived Polyols as Sustainable Alternatives for Polyurethane Synthesis

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Polyurethanes are essential polymeric materials used in a wide range of industrial applications, including coatings, adhesives, elastomers, and foams. However, their production still relies heavily on non-renewable petroleum-based feedstocks, raising concerns regarding fossil resource depletion and greenhouse gas emissions. In line with the global transition toward net-zero emissions, the development of sustainable polyurethane materials from alternative carbon resources has become increasingly important. In this context, captured CO₂ represents an attractive and abundant C1 resource that can be converted into value-added polymeric materials.

In this study, CO₂-based polyurethanes were developed using CO₂-derived polyols as sustainable alternatives to conventional petroleum-based polyols, one of the major components of polyurethanes. The CO₂-based polyols were synthesized through a Zn-gallate-catalyzed process and subsequently incorporated into polyurethane formulations with isocyanates and a chain extender. The influence of the composition and structure of the CO₂-based polyols on the thermal and mechanical properties of the resulting polyurethanes was systematically investigated.

The properties of the prepared polyurethanes were evaluated using differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), Shore hardness testing, and tensile strength measurements. The results demonstrate that the thermal and mechanical properties of polyurethanes can be effectively tuned by adjusting the PU composition.

This study demonstrates the potential of CO₂-derived polyols as sustainable building blocks for polyurethane synthesis. By converting captured CO₂ into high-value polymeric materials, the developed CO₂-based polyurethanes provide a promising strategy for reducing dependence on fossil resources while maintaining desirable material properties. These findings contribute to the advancement of sustainable polyurethane technologies and the practical utilization of CO₂ in polymer production.

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Divergent Synthesis of (Allo)Securinine & (Allo)Norsecurinine

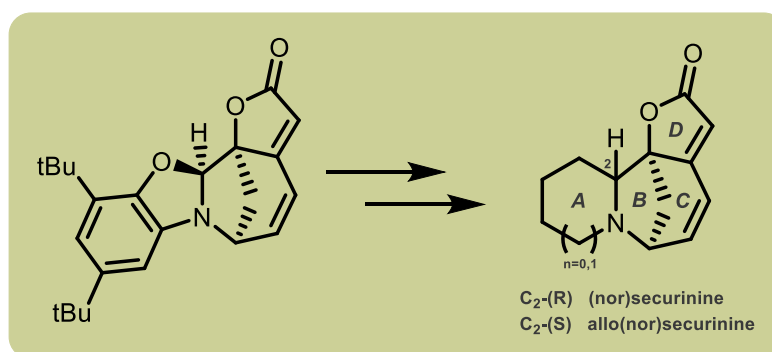
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Securinega alkaloids represent a structurally diverse family of natural products derived from tetracyclic monomeric frameworks. Among them, monomeric Securinega alkaloids are particularly valuable as precursors to high-order, high-oxidation-state, and oxidized high-order Securinega alkaloids. The azabicyclo[3.2.1] B/C-ring core provides a strategic branching point for monomeric Securinega alkaloid synthesis, because late-stage A-ring formation would enable divergence toward either norsecurinane or securinane frameworks bearing pyrrolidine or piperidine A-rings, respectively. ^[1] However, most previous syntheses construct the A-ring during the early or middle stages of the route, thereby committing the synthesis to a single monomeric framework.

Herein, we envisioned a divergent strategy to overcome this limitation. Our approach first constructs a common BCD-ring core and converts it into an N,O-acetal intermediate, from which late-stage A-ring formation can be achieved by varying the carbon nucleophile. ^[2] This strategy provides a unified platform for accessing monomeric Securinega alkaloids bearing either norsecurinane or securinane cores from a common intermediate.



Reference

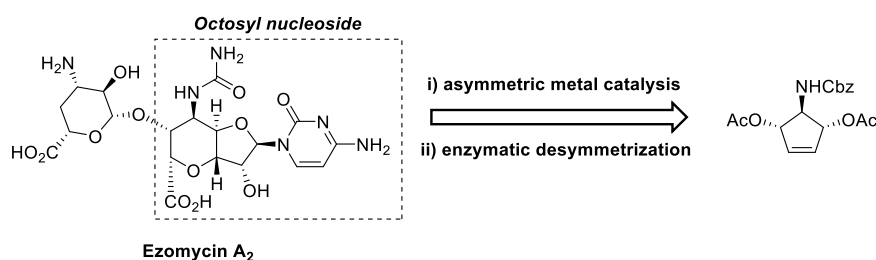
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A Synthetic Study towards Ezomycin A₂

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Ezomycin A₂, an antifungal antibiotic isolated from *Streptomyces*, exhibits selective activity against phytopathogenic fungi including *Sclerotinia sclerotiorum* and *Botrytis* species.¹ It possesses a bicyclic nucleoside–disaccharide framework featuring an octosyl core, a C8-fused furopyran ring system. Herein, we report an efficient synthesis of the octosyl nucleoside of Ezomycin A₂ from diacetoxycyclopentene *via* a strategy combining enzymatic desymmetrization and asymmetric metal catalysis.



Acknowledgement

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Development of a Sequential Oxidative Dearomatization Strategy Toward the Total Synthesis of Herquiline A

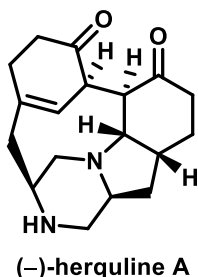
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Herquiline A is a highly strained alkaloid isolated from *Penicillium herquei* Fg-372 in 1979,¹ which inhibits ADP-induced platelet aggregation¹ and the replication of influenza virus A/PR/8/34.² Herquiline A possesses a highly strained, bowl-shaped pentacyclic (6-9-6-5-6) framework featuring a C3–C3' linkage between two cyclohexanone rings, derived from a dityrosine precursor, with stereogenic centers installed at C3 and C3'.³ Formation of a pyrrolidine ring through a C2–N10 bond rigidly locks the molecular conformation, collectively generating significant angle, torsional, and steric strain. Consequently, construction of this highly constrained architecture requires formation of key C–C and C–N bonds in a sterically congested environment with precise stereochemical control, rendering the total synthesis of herquiline A a formidable synthetic challenge.

This talk will present our recent progress toward the total synthesis of herquiline A. To address the challenges encountered in previous synthetic approaches,⁴ we designed a strategy centered on the preinstallation of a stable stereochemical arrangement at the C3–C3' position prior to the cyclization. By preparing an asymmetrically protected biaryl diketopiperazine intermediate, we envisioned that a sequential oxidative dearomatization would establish the stereochemical foundation required for constructing herquiline A framework. Studies toward the implementation of this strategy and the completion of the total synthesis are currently underway.



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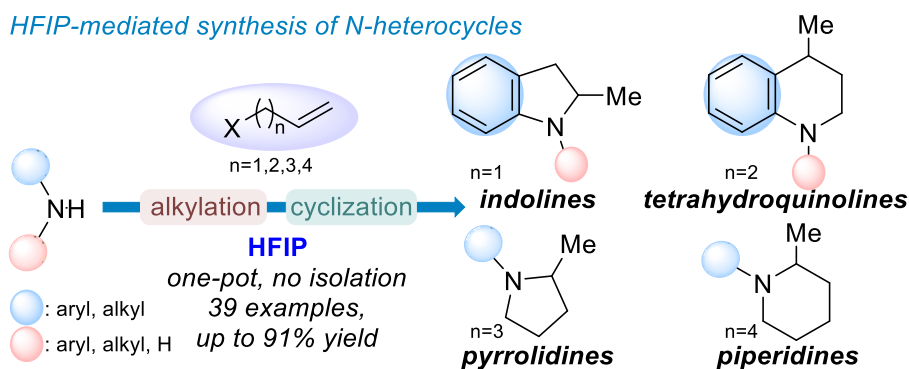
HFIP-Promoted One-Pot Synthesis of Indolines and Pyrrolidines

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A practical method for the synthesis of N-heterocycles from readily available amines and alkyl halides in HFIP has been developed. HFIP enables sequential alkylation and cyclization in a one-pot process under acidic conditions. A range of indoline and pyrrolidine derivatives were obtained in moderate to good yields, with tolerance toward various functional groups and nitrogen substitution patterns. The synthetic utility of this approach was demonstrated through gram-scale reactions, further transformation of pyrrolidines, and a concise formal synthesis of cephalotaxine.

HFIP-mediated synthesis of N-heterocycles



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Photo-Induced Activation of Tetrahydroisoquinoline(THIQ)-Based Amides for Transamidation

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Amide bonds are among the most robust functional groups in organic molecules due to their significant resonance stabilization, making direct transamidation inherently challenging^[1]. Herein, we report a photo-induced strategy for the activation of tetrahydroisoquinoline (THIQ)-based amides using Selectfluor under visible-light irradiation. Upon irradiation with blue LEDs, THIQ-derived amides undergo selective C–N bond cleavage to generate reactive acyl fluoride intermediates under mild and metal-free conditions. The resulting intermediates readily react with a variety of amine nucleophiles to afford the corresponding amide products in good to excellent yields. This protocol exhibits broad substrate compatibility and provides an efficient approach for amide bond transformation without the need for transition-metal catalysts or harsh reaction conditions. Mechanistic investigations suggest that photoinduced oxidation of the THIQ moiety plays a key role in facilitating amide bond activation. This methodology offers a practical platform for transamidation reactions and expands the synthetic utility of THIQ-based amides in organic synthesis.

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Organo-photocatalyzed Fluoromethylative Dimerization of Allenes

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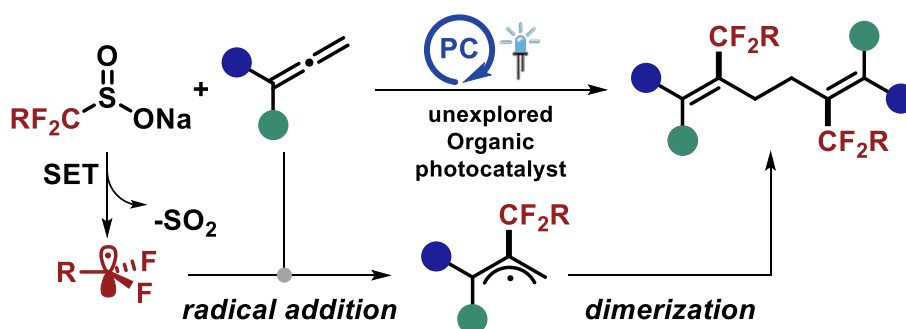
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Abstract: -

Organic photocatalysis has emerged as a sustainable and powerful alternative to conventional transition metal-based photo redox systems owing to its cost effectiveness, low toxicity and environmental compatibility. Developing synthetic methodologies for the incorporation of fluorinated motifs into organic molecules has attracted considerable attention due to the significant impact of fluorinated groups on the biological, pharmaceutical properties of the compounds. Despite significant advances in visible light mediated radical transformations, fluoromethylative dimerization remained unexplored.

Herein, we report the first example of an organic photocatalyst-driven fluoromethylative dimerization of allenes under visible-light irradiation, in which the newly explored organic photocatalyst demonstrated superior efficiency and significant economic advantages over conventional organic photocatalysts, highlighting its potential as a sustainable alternative for visible-light-driven radical transformations. Using the light irradiation in presence of oxidant, a variety of allene substrates underwent efficient fluoromethylative radical functionalization, providing access to structurally diverse -CF₃ and -CF₂H containing dimers in moderate to good yields. The operational simplicity, broad substrate applicability, and use of a cost-effective organic photocatalyst further highlight the significance of this protocol for future applications in synthetic and medicinal chemistry.



Aliphatic Dicarboxylate Linkers in MOFs: Perspectives on Coordination Dynamics and Ligand Exchange

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Metal–organic frameworks (MOFs) have predominantly relied on rigid aromatic linkers, whose well-defined geometry and strong coordination enable the construction of highly crystalline and robust structures. In contrast, the use of aliphatic linkers remains relatively underexplored, despite their potential to introduce structural flexibility and unconventional framework behavior.^[1] This study aims to challenge the conventional design paradigm by investigating the unexplored capabilities of aliphatic-linker-based MOFs and uncovering how their distinct coordination characteristics influence framework chemistry.

We synthesized a series of zirconium-based MOFs incorporating aliphatic dicarboxylate ligands with systematically varied chain lengths and conformational freedom. Particular emphasis was placed on understanding the mechanistic differences in metal–carboxylate bonding compared to aromatic counterparts, especially in the context of framework assembly and post-synthetic exchange (PSE).^[2] Our analysis reveals that the increased flexibility of aliphatic linkers alters coordination dynamics, leading to distinct bonding environments and enhanced ligand mobility. These features facilitate atypical PSE behavior, suggesting a fundamentally different exchange mechanism from that observed in conventional aromatic MOFs. By elucidating how linker flexibility governs both framework formation and post-synthetic reactivity, this work highlights the untapped potential of aliphatic MOFs and establishes new design principles for dynamic and transformable porous materials.

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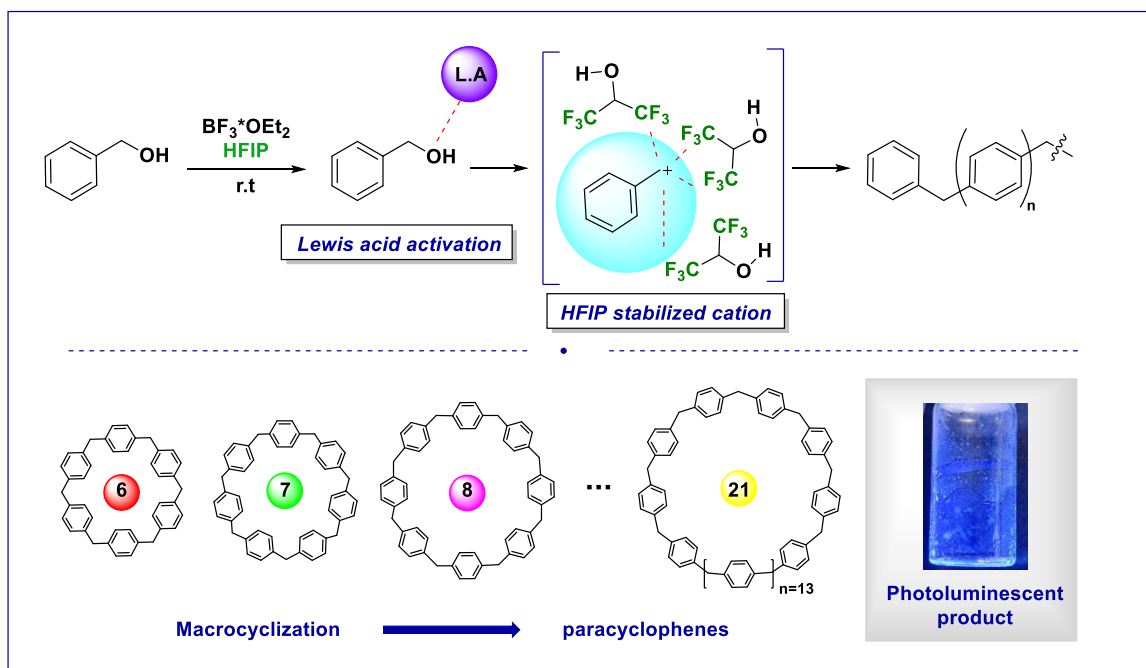
Abstract

HFIP-Enabled Benzyl Cations Stabilization for Paracyclophene Synthesis

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An HFIP-enabled synthesis of paracyclophanes via benzyl cation stabilization is described. In this approach, benzyl alcohol is activated by $\text{BF}_3 \cdot \text{OEt}_2$ in HFIP, promoting the oligomerization of benzyl units followed by macrocyclization. The unique properties of HFIP, including strong hydrogen-bond donation and low nucleophilicity, allow effective stabilization of cationic intermediates, thereby facilitating macrocycle formation under mild conditions and low Lewis acid loading. Para-selective macrocycles are formed with exclusive selectivity, while accommodating a range of macrocycle sizes ($n = 6-21$). Interestingly, the resulting oligomeric mixture exhibits blue fluorescence under UV irradiation (355 nm). This photoluminescent behavior suggests the potential of these compounds as blue-emissive organic materials for applications in materials science, optoelectronics, bioimaging, and fluorescent labeling.



Asymmetric Synthesis of (2-aminoalkyl)arylphosphonates through Three-Component Coupling Reactions Involving, Arynes, Phosphites, and Imines

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Chiral amines represent a privileged structural motif in medicinal chemistry, comprising approximately 45% of FDA-approved small-molecule drugs. The ability to access enantiomerically pure amines with diverse substitution patterns is therefore highly desirable in pharmaceutical synthesis. Conventional approaches, including asymmetric transition-metal catalysis and reductive amination, often suffer from harsh reaction conditions, limited functional group tolerance, and multistep sequences that reduce overall synthetic efficiency. In this context, benzyne-based multicomponent reactions offer an attractive strategy for the rapid construction of structurally complex amines in a single operation..

Herein, we present an asymmetric synthesis of (2-aminoalkyl)arylphosphonates through three-component coupling reactions involving arynes, phosphites, and chiral N-sulfinyl imines under mild conditions. This strategy employs an N-sulfinyl imine as the electrophilic component, while phosphite acts as the nucleophile to initiate addition to benzyne, generating a reactive zwitterion that subsequently attacks the N-sulfinyl imine in a stereoselective manner. The Ellman auxiliary effectively controls facial selectivity during C–N bond formation, affording high diastereoselectivity. This method provides a practical and efficient approach to pharmaceutically relevant chiral amine scaffolds.

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Multifunctional D-A-D Photomaterials: Steric Engineering for Advanced Phototherapy

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Naphthalenediimide (NDI) is an electron acceptor showing high photochemical stability. Its structural flexibility allows the modulation of its photophysical properties through diverse molecular designs. Introduction of electron-donating groups onto the planar NDI core, which possesses an inherently low LUMO, leads to a donor-acceptor-donor (D-A-D) framework, enabling fine tuning of the HOMO-LUMO energy levels and the absorption and emission spectra. In addition, the flat and compact aromatic core of NDI dyes promotes efficient aggregation structures through strong π - π stacking interactions, and their electron-withdrawing character makes them highly important in both fundamental and applied research. As a result of these properties, NDI has been widely used in photodynamic therapy, photothermal therapy, organic solar cells, and organic field-effect transistors. To further optimize its optoelectronic performance for specific biomedical and material applications, structural modifications of the NDI core are often required. The addition of thiophene extends π -conjugation, inducing red-shift absorption. In particular, the high quinoidal properties of thiophene in planar structures maximize the tendency for intramolecular charge transfer and further enhance the electron-donating ability of the donor. Also, due to the highly planar structure of thiophene and NDI, intermolecular electron transfer can occur efficiently in the stacked state.

This work presents an innovative idea of dual-therapeutic mechanism, derived from a material traditionally uncommon in phototherapy, which effectively overcomes the tumor microenvironment. By precisely tuning the planarity of thiophene and the steric hindrance of alkyl chains to prevent excessive stacking, this design maximizes Type I PDT efficiency while simultaneously inducing a PTT effect through intramolecular rotation.

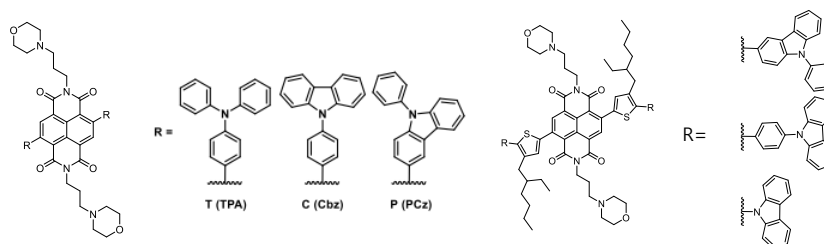


Figure 1. The structure of NT2-L-R and NDI-T-R

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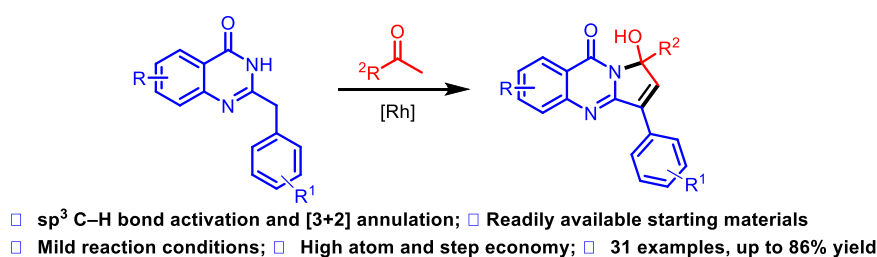
Rhodium-Catalyzed C–H Activation/Annulation of 2-Benzylquinazolinones with Ketones for Diversely Functionalized Pyrrolo[2,1-*b*]quinazolinones

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Abstract

Quinazolinone-fused polycyclic skeletons are privileged scaffolds commonly found in natural products and bioactive molecules. These compounds display a broad range of biological and pharmacological activities including potent antimicrobial, anti-inflammatory, anti-oxidant, anticancer, anti-proliferation, anticonvulsant, and anti-depressant activities. Herein, we report a rhodium-catalyzed sp^3 C–H activation of 2-benzylquinazolinones with ketones, enabling a [3+2] annulation strategy for the rapid construction of biologically relevant pyrrolo[2,1-*b*]quinazolinones (Scheme 1). This protocol features readily available starting materials, broad substrate scope, and good functional group tolerance. The protocol offers a rapid and efficient synthetic route to introduce various functional groups such as aryl, polyaromatic, heteroaromatic, and alkyl substituents, onto biologically interesting pyrrolo[2,1-*b*]quinazolinone scaffolds.



Scheme 1. Synthetic Strategy for Pyrrolo[2,1-*b*]quinazolinones *via* Rhodium-Catalyzed sp^3 C–H Activation and [3+2] Annulation of 2-Benzylquinazolinones with Ketones

Photocatalytic Degradation of Lignin Model Compounds under Mild Conditions

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Lignin is an abundant renewable aromatic biopolymer and has attracted significant attention as a sustainable feedstock to produce value-added chemicals. However, its structurally complex and heterogeneous nature makes direct mechanistic investigations challenging. To address this limitation, lignin model compounds (LMCs) incorporating representative interunit linkages are widely employed to investigate selective depolymerization pathways.

In this study, a series of lignin model compounds containing β -O-4, 4-O-5, α -O-4, and β -5 linkages were synthesized to systematically evaluate their reactivity under photocatalytic conditions. Photocatalytic degradation reactions were performed under ambient conditions using a range of photocatalysts, and the resulting products were quantitatively analyzed by GC to determine product distributions and catalytic efficiencies.

While the β -O-4 model compound exhibited efficient bond cleavage under mild conditions, other linkages displayed distinct reactivity patterns, reflecting differences in bond dissociation energies and electronic environments. Comparative analysis revealed that catalyst selection plays a critical role in governing both conversion and product selectivity across different linkage types.

Overall, this study demonstrates the potential of mild photocatalytic systems for the selective degradation of lignin model compounds and provides mechanistic insights into linkage-dependent reactivity, contributing to the development of effective strategies for lignin valorization.

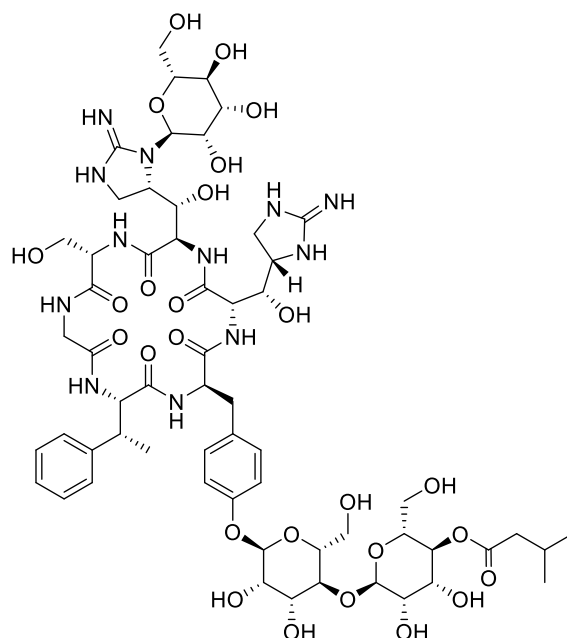
A synthetic study towards mannopeptimycin ϵ

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Mannopectimycin ϵ isolated from *Streptomyces hygroscopicus* LL-AC98 in the 1950s, were found to exhibit significant activity against clinically relevant gram-positive bacteria, including methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant enterococci (VRE).¹ The highly unusual structural features and potent antibacterial properties of the MPPs have attracted considerable interest in their chemical synthesis over the past decade.^{2,3,4} Herein, a synthetic effort toward a mannopeptimycins ϵ is presented. The key strategy features Pd-catalyzed hydroalkoxylation of a tyrosine-derived phenolic alcohol, followed by Ru-catalyzed ring-closing metathesis and Os-catalyzed dihydroxylation.⁵



Mannopectimycin ϵ

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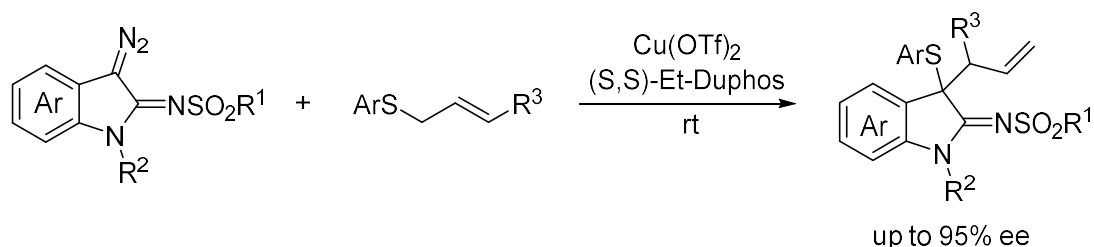
Asymmetric Thio-Allylation of 2-Imino-3-Diazoindolines

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The C3-stereogenic indoline scaffold constitute a valuable molecular framework in drug discovery, owing to its association with diverse range of biological activities. Consequently, enantioenriched C3-chiral indolines have emerged as important synthetic targets due to their pharmacological potential. The Doyle-Kirmse reaction, a [2,3]-sigmatropic rearrangement of allyl or propargyl sulfonium ylides, provides a versatile approach to construct carbon-carbon and carbon-sulfur bonds.¹ In this study, we employed 2-imino-3-diazo-indolines as substrates and investigated their Doyle-Kirmse reaction with allyl sulfides with a new chiral center generated. Using Cu-catalyst and (S,S)-Et-DuPhos as a chiral ligand, enantioselective Doyle-Kirmse products were successfully obtained. The reaction proceeds via formation of Cu-carbene complex which is then attacked by allyl sulfides.



Scheme 1. Asymmetric thio-allylation

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Poster Presentation

Carbamoylation of Aryl/Benzyl Chlorides by Direct C–H Functionalization of Formamide Derivatives via Ni/Photoredox- Catalyzed Cross-Coupling

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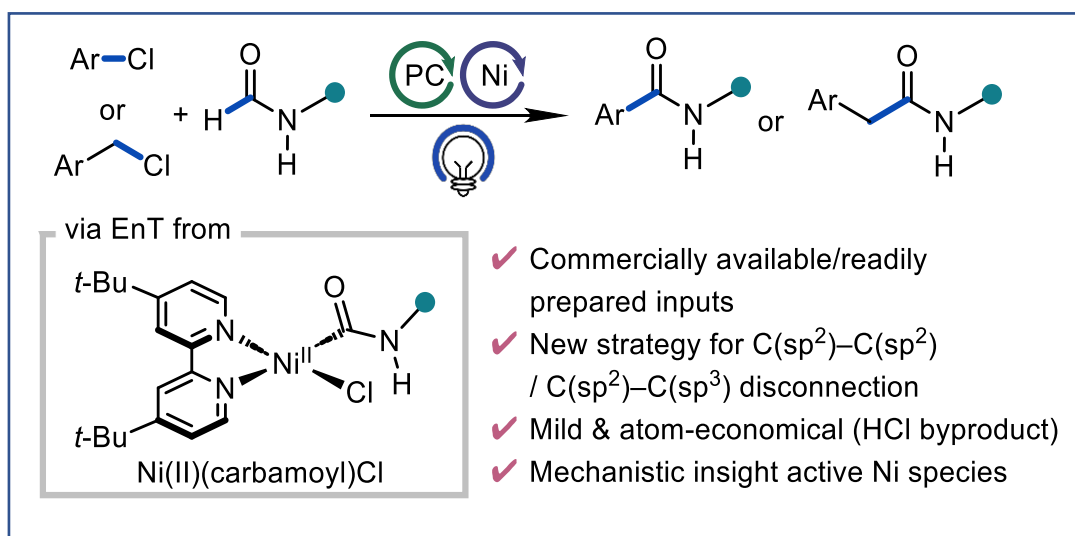
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We report a Ni/photoredox dual catalytic protocol that activates the formyl C–H bond of simple formamides to enable C(sp²)–C(sp²)/C(sp²)–C(sp³) carbamoylation with aryl and benzyl chlorides. This transformation proceeds without the need for prefunctionalized carbamoyl radical precursors, external oxidants, or halogen atom transfer (XAT)/hydrogen atom transfer (HAT) reagents by harnessing in situ-generated Cl radicals for selective HAT followed by the cross-coupling event. This strategy provides a mild and atom-economical platform for accessing structurally diverse amides, including sterically hindered variants that are difficult to access through classical C–N bond-forming methodologies. Stoichiometric studies of independently synthesized Ni complexes reveal a distinct pathway involving a Ni(II)(carbamoyl)Cl complex as the active intermediate, diverging from previously established C(sp³)–H functionalization chemistry.



Bias-Free Dye-Sensitized Photoelectrochemical Cells with Anodic Valorization mediated by ABNO in Acidic Conditions

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The increasing global demand for sustainable energy solutions has intensified interest in photoelectrochemical (PEC) systems, which enable the direct transformation of solar energy into chemical fuels. Among various PEC designs, dye-sensitized photoelectrochemical cells (DSPECs) are distinguished by their utilization of photosensitizers, offering tunability, cost-effectiveness, and compatibility with earth-abundant materials. These advantages have positioned DSPECs as a promising platform for solar-driven fuel production and organic transformations.

Conventional DSPEC studies have predominantly focused on cathodic hydrogen evolution reactions (HER) for solar-to-fuel conversion. However, their overall efficiency remains constrained by the sluggish anodic oxygen evolution reaction (OER), which requires high overpotentials due to its thermodynamic and kinetic limitations. To overcome this challenge, previous strategies have employed tandem PEC architectures or multiple light absorbers to compensate for the high anodic overpotential, but these approaches introduce additional complexity and cost.

Here, we introduce a bias-free DSPEC system that operates with a single light absorber by employing 9azabicyclo[3.3.1]nonane N-oxyl (ABNO) as a redox mediator to drive selective anodic oxidation of primary alcohols under acidic conditions. By integrating this mediator, we achieve a single-light-absorber DSPEC that operates under genuinely bias-free conditions, marking a significant advance in PEC-driven organic transformations. This study highlights the critical interplay between mediator selection and reaction environment in lowering the kinetic barriers of anodic transformations, offering new design principles for PEC systems that integrate value-added oxidation processes.

KEYWORDS: *Bias-*

free, Dyesensitized photoelectrochemical cell (DSPEC), Redox flow cell, Nitroxyl radical, Primary alcohol oxidation

Visible-Light-Photoreductive Disassembly of Fe(III)-Phytic Acid Nanoshells Facilitates On-Demand Cargo Release on Cell Surface

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ABSTRACT:

Controlled disassembly of nanoshells on cell surfaces remains a key challenge, as most systems lack mechanisms for precise and cytocompatible removal. Here, we report a visible-light-driven photoreductive strategy for the disassembly of Fe(III)–phytic acid coordination nanoshells. In the presence of oxalate, these assemblies undergo photoreduction via ligand-to-metal charge transfer, leading to destabilization of coordination interactions and rapid structural disassembly under mild conditions. Using nanofilms as a model system, the disassembly kinetics are governed by light intensity, while temporal regulation is achieved through periodic light on/off cycles. The generality of the approach is evident across Fe(III)–ligand systems with different ligand chemistries. This approach is further applied to living yeast cells, where nanoshells are constructed and subsequently removed without compromising cellular viability. This disassembly process enables on-demand release of bactericidal agents, resulting in light-triggered antibacterial activity in co-culture environments. This work introduces a non-invasive platform for modulating coordination network stability and offers a route toward dynamic control of cell–material interfaces.

포스터 발표

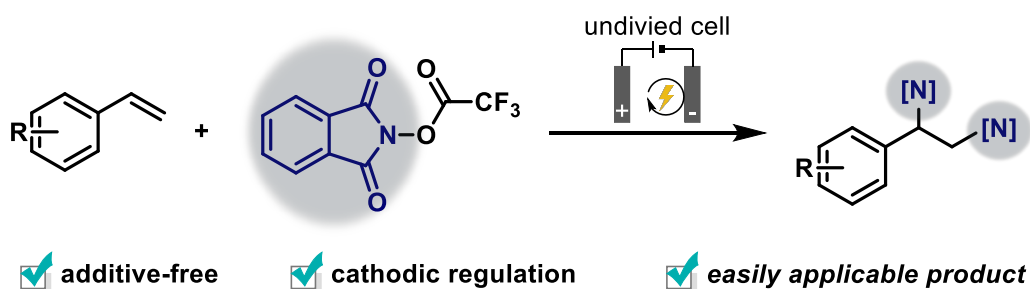
Electrochemical 1,2-Diamination of Styrenes

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Here we report an efficient, additive-free electrochemical 1,2-diamination of styrenes using N-phthalimide derivatives as the nitrogen source. Traditional diamination requires a mismatch between nucleophiles and electrophiles for a reaction to occur, whereas electrochemical diamination allows for coupling between two nucleophilic species. However, despite this advantage, conventional electrochemical diamination reactions typically occur at the anode, requiring the use of a mediator. In this study, the reaction was carried out without external additives through precise cathodic control. Furthermore, using N-Phthalimide as an amine source enables facile post-synthetic diversification, demonstrating the high synthetic utility of this methodology.



Molecular Design Strategy for Iridium(III)-based Photosensitizers to Enhance the Phototoxicity Index and Efficacy of Photodynamic Therapy

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In photodynamic therapy (PDT), the phototoxicity index (PI) is crucial for evaluating photosensitizer (PS) efficiency, with dark toxicity lowering PI and increasing side effects. Ir(III)-based PSs effectively generate ROS, but some exhibit high dark toxicity, reducing PDT efficacy. Here, we propose a molecular design strategy to mitigate dark toxicity and enhance phototoxicity by modulating charge and incorporating organelle-targeting groups. Our results show that neutrally charged PSs exhibit lower dark toxicity than positively charged PSs, while organelle-targeting modifications enhance phototoxicity. This study highlights the importance of optimizing molecular charge and targeting properties to maximize PDT effectiveness.

Synthesis and utilization of N-Silylallenamines via Hydrosilylation of conjugated Imino alkynes

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Despite their synthetic value, allenamines are rarely utilized due to their severe instability toward moisture and tendency to polymerize. We addressed this limitation through the $B(C_6F_5)_3$ -catalyzed hydrosilylation of conjugated imino alkynes under strictly anhydrous conditions, achieving the quantitative *in situ* formation of *N*-silylallenamines. Taking advantage of this clean conversion, we directly probed their chemical behavior toward a series of electrophiles. Notably, reactions with diverse chlorination sources revealed promising reactivity patterns, underscoring their potential as nucleophilic partners. This streamlined method provides a practical platform for further exploring the unique properties of allenamines in organic synthesis.

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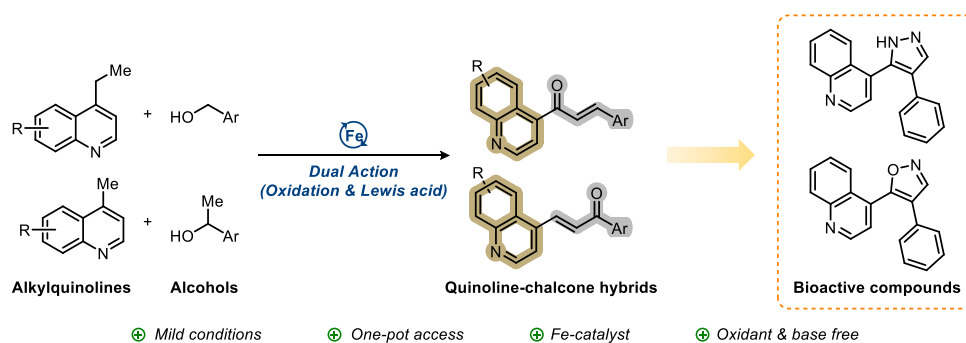
Direct access to quinoline-chalcone hybrids through iron-catalyzed aerobic oxidative sp^3 C-H functionalization of unactivated alkylquinolines

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Quinoline-chalcone hybridization has emerged as a versatile strategy for anticancer drug discovery.¹ Nevertheless, established synthetic approaches to quinoline-chalcone hybrids are often limited by multistep preparation of quinoline-carbonyl intermediates and the dependence on harsh conditions.² Herein, we report a one-pot strategy for the direct synthesis of quinoline-chalcone hybrids via iron-catalyzed aerobic oxidative sp^3 C-H activation. Notably, the iron catalyst serves a dual function by mediating the oxidative transformation and acting as a Lewis acid to promote the subsequent aldol condensation, obviating the need for external oxidants and bases. In addition, the resulting quinoline-chalcone hybrids can be readily diversified, highlighting the synthetic utility toward the synthesis of bioactive compounds.³



Scheme 1. One-pot synthesis of quinoline-chalcone hybrids and their application.

Acknowledgment

This work was supported by the National Research Foundation of Korea (NRF) funded by the Ministry of Science and ICT (RS-2023-00218616, RS-2024-00351679, and RS-2025-02263193) and the Ministry of Education (RS-2025-25397599).

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Studies toward the Total Synthesis of (-)-minovincine and (-)-vindoline via Intramolecular Diels-Alder Reaction

Hee-yun Park and Cheon-gyu Cho*

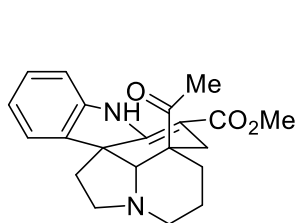
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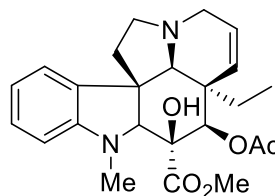
(-)-Vindoline is a complex pentacyclic monoterpene indole alkaloid and an indispensable biosynthetic precursor for anti-cancer drugs, featuring a 6-methoxyindole core fused with a spirocyclic tetrahydropyrrole framework.

In this study, an efficient route toward (-)-vindoline was initiated from 3,5-dibromo-2-pyrone via a sequential isomerization and intramolecular Diels-Alder cycloaddition sequence. To overcome severe reactivity issues in the pivotal C-N coupling, a substrate modification strategy via structural simplification successfully enabled the Fischer indolization to accomplish the total synthesis of (-)-minovincine.

Expanding upon this model study, this structural simplification approach is currently being applied to the (-)-vindoline pathway to restore the desired C-N coupling reactivity.



(-)-minovincine



(-)-vindoline

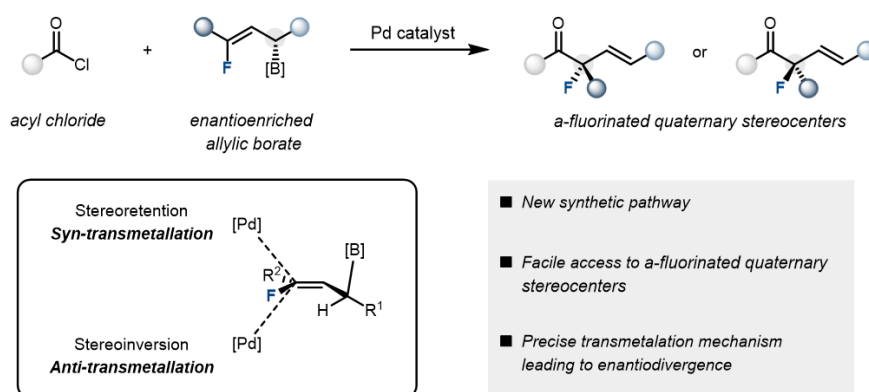
Enantiodivergent Synthesis of α -Fluorinated Quaternary Centers via Pd-Catalyzed Stereospecific Allylative Suzuki Cross-Coupling

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A novel strategy for the enantiodivergent Pd-catalyzed stereospecific cross-coupling of enantiomerically enriched fluorinated allylic boronates has been developed.¹ This protocol provides access to synthetically challenging α -fluorinated quaternary carbonyl scaffolds with high fidelity of stereochemical transfer. Notably, rational phosphine-ligand design enables selective engagement of either stereoinvertive or stereoretentive pathways, delivering ligand-controlled stereochemical outcomes.²⁻³



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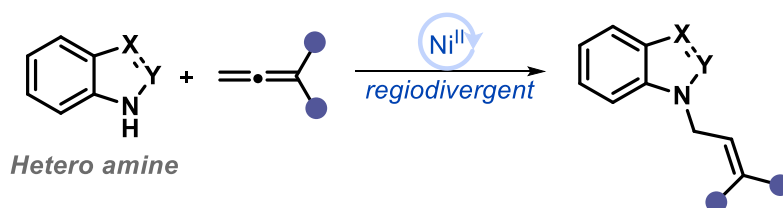
Nickel-catalyzed Hydroamination of allenes

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In this study, we report a Ni-catalytic system that enables the hydroamination of allenes with structurally diverse and medically relevant hetero amines. This hydroamination proceeds with high N-site selectivity. Moreover, the mild reaction conditions and broad functional group tolerance allow rapid construction of molecular complexity and application to the late-stage functionalization of bioactive compounds.



[Poster Presentation]

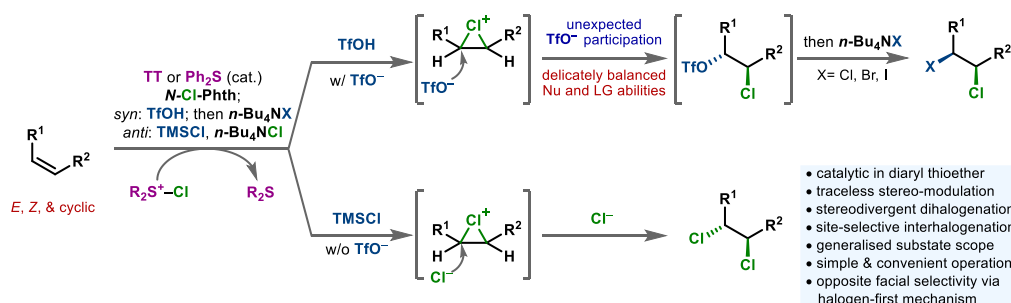
Catalytic, stereodivergent, diastereospecific dichlorination and site-selective *syn*-interhalogenation of alkenes via traceless stereo-modulation

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Direct access to *syn*-dihalogenation of alkenes requires an innovative alteration of the well-defined conventional mechanism and thus is considered an intriguing challenge in the field of organohalogen synthesis. Despite the remarkable recent achievements, including our own, there is still room for improvement in terms of the substrate scope, operational convenience, and mechanistic diversity. Here, by inverting the typical electronic properties of the electrophilic alkene activator and the halogen nucleophiles, a simple catalytic system was devised that operates via a reversed alkene addition sequence. After the initial formation of the chloriranium intermediate, the triflate anion serves as a traceless stereo-director that temporarily participates, alters the stereochemistry, and readily disappears. This mechanism is deceptively straightforward, but such a dual-characteristic modulator must have delicately balanced nucleophilicity and leaving group ability at the same time. Upon realization of these conflicting criteria, the substrate scope of *syn*-dichlorination has been substantially generalized to include both *E/Z*-alkenes as well as more challenging cycloalkenes. Also, the unique halogen-first mechanism exhibited an unusual facial selectivity with respect to the pre-existing stereocenter. Furthermore, expanding the halogen scope to Br and I enabled site-selective *syn*-interhalogenation. In addition, the presence or absence of a stereo-modulator enabled stereodivergent dichlorination. Therefore, through our work, the *syn*-dihalogenation chemistry has been greatly diversified.



Development of New Therapeutic Agents for NTM Infections

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Mycobacterium abscessus is a rapidly growing nontuberculous mycobacterium (NTM) that causes severe pulmonary infections, particularly in patients with chronic lung diseases such as cystic fibrosis and bronchiectasis. The treatment of *M. abscessus* infection remains highly challenging because of its intrinsic resistance to many clinically used antibiotics and the limited efficacy of current multidrug regimens. Therefore, the discovery of new antibacterial agents with novel modes of action is urgently needed for the effective treatment of *M. abscessus*-associated pulmonary diseases.

In our previous study, we identified DATPT as a potential lead compound with antibacterial activity against pathogenic bacteria. Notably, oral administration of DATPT significantly reduced the bacterial burden in a mouse model of *M. abscessus* infection, suggesting its potential as a promising scaffold for the development of antibacterial agents. Based on these studies, we designed and synthesized a novel series of DATPT derivatives and evaluated their antibacterial activity against multiple *M. abscessus* strains through in vitro assays, followed by in vivo efficacy studies.

Among the synthesized derivatives, OMCL18033 was identified as the most potent inhibitory agent against *M. abscessus*. To investigate its mechanism of action and facilitate therapeutic target identification, we further designed and synthesized photoaffinity probes based on the OMCL18033 scaffold. Current efforts are focused on identifying the molecular target of OMCL18033 and optimizing its potency, selectivity, and drug-like properties.

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Ni-Catalyzed Cross-Coupling Strategy for Ketimine Synthesis from Iminopyridinium Salts

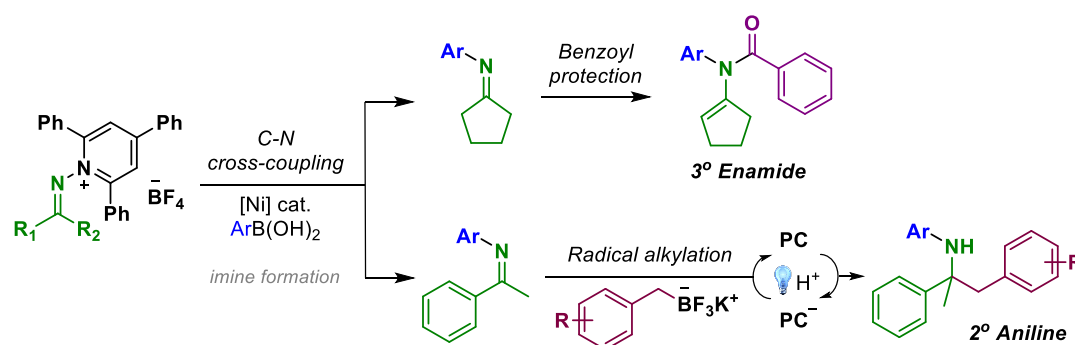
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The N–N reductive cleavage of N-amino-substituted pyridinium salts has been extensively investigated as a strategy for generating nitrogen-centered radicals. However, the selective generation of iminyl radicals from N-iminopyridinium compounds remains comparatively underexplored. We hypothesized that the electron-withdrawing cationic pyridinium group could facilitate N–N bond homolysis and thereby predominantly yield iminyl radicals upon single-electron reduction.

Iminyl radicals have been explored in a range of radical transformations; however, direct C–N bond formation mediated by iminyl radicals remains rare. Herein, we report a Ni-catalyzed, iminyl radical-mediated C–N cross-coupling strategy employing Katritzky-type N-iminopyridinium salts as both redox-active electrophiles and practical iminyl radical precursors. This method enables efficient C–N bond construction that has been previously inaccessible through conventional approaches. We further demonstrate the synthetic utility of the resulting ketimines through a subsequent photoredox-catalyzed radical alkylation. Although numerous methods have described radical alkylation of iminyl substrates via α -amino radical intermediates, these transformations have largely been limited to aldimines; radical-based functionalization of ketimines remains a challenging and underexplored area due to their reduced electrophilicity and steric demands. To address this gap, we report an α -amino radical-mediated, photoredox-catalyzed radical alkylation of ketimines using potassium trifluoroborates as alkyl radical precursors, providing a two-step sequence that converts N-iminopyridinium salts into structurally diverse, alkylated ketimine products.



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Prediction of Supramolecular Folding via Hierarchical Boltzmann Adaptive Sampling

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Predicting supramolecular structures is essential for rational molecular design because the function of synthetic oligomers often emerges from three-dimensional organization governed by non-covalent interactions rather than covalent connectivity alone. In foldamers and related non-natural oligomeric systems, stable conformations are determined by a delicate balance of hydrogen bonding, π - π stacking, dispersion, and steric effects. However, their diverse backbones, aromatic units, non-canonical linkages, and broad conformational landscapes make experimental characterization and exhaustive high-level computation challenging. Therefore, accurate structure prediction provides a rational basis for identifying stable supramolecular motifs and designing functional synthetic architectures.

To address this challenge, we combine Hierarchical Boltzmann Adaptive Sampling with AIMNet2, a deep-learned interatomic potential that enables rapid energy evaluation with near-DFT-level accuracy. This strategy reduces the number of conformations requiring explicit evaluation while maintaining reliable energetic screening. Using this framework, we explored low-energy structural candidates of diverse synthetic oligomers, including aromatic foldamers and peptide-inspired systems. The predicted structures showed strong agreement with experimentally reported crystal structures, achieving low RMSD values across multiple structural classes. Importantly, the workflow captured key non-covalent interaction motifs, including intramolecular hydrogen-bond networks, which are central to supramolecular organization. These results suggest that the proposed workflow can efficiently identify realistic folded conformations of structurally diverse non-natural oligomers, expanding the accessible design space for supramolecular and foldamer-based molecular architectures.

High-Precision Imaging of β -Galactosidase Using an Enzyme-Activated Ratiometric Fluorescent Probe

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β -Galactosidase is an important biomarker closely associated with cancer progression, cellular senescence, and tumor microenvironment remodeling. However, most previously reported fluorescent probes rely primarily on single-channel turn-on mechanisms and do not sufficiently consider the stereochemical characteristics of enzyme substrates, which limits their selectivity and quantitative imaging accuracy. In this study, we designed and synthesized a stereochemistry-defined naphthalimide-based ratiometric fluorescent probe system composed of DLNB and its stereoisomer LN to investigate the influence of substrate stereochemistry on enzymatic recognition and fluorescence signal conversion.

Among the two probes, only DLNB underwent selective hydrolysis in the presence of β -galactosidase, exhibiting a rapid blue-to-green ratiometric fluorescence conversion within 20 seconds. The ratiometric response enabled internally calibrated quantitative imaging with improved reliability and reduced environmental interference compared to conventional single-emission probes. In contrast, LN showed negligible fluorescence conversion under identical conditions, indicating strong stereochemistry-dependent enzymatic discrimination.

To further elucidate the origin of this selectivity, molecular docking analysis was performed. The results revealed that DLNB formed stable binding interactions with active-site residues through multiple hydrogen bonds and π -interactions, allowing efficient substrate recognition and catalytic activation. Conversely, LN exhibited reduced binding stability and unfavorable orientation within the enzyme pocket due to stereochemical mismatch, leading to suppressed hydrolysis efficiency.

Overall, this study demonstrates that substrate stereochemistry is a decisive factor governing enzymatic selectivity and fluorescence signal conversion efficiency. Furthermore, it proposes a high-specificity and high-precision molecular design strategy for enzyme-activated fluorescent imaging systems. These findings provide important theoretical insights and practical guidance for the development of next-generation molecular probes capable of selectively visualizing β -galactosidase-overexpressing cancer cells and senescent biological systems with enhanced accuracy and sensitivity.

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Expanding the Redox Boundary of Reductive Hydrazine Chemistry: Selective Partial Reduction of Furans Enabled by Alternating Polarity Electrolysis

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The selective partial reduction of aromatic heterocycles remains one of the classical challenges in synthetic chemistry, necessitating reagents that are powerful enough to overcome aromatic stabilization yet simultaneously mild to preserve fragile functional groups. Hydrazine, operating through its active reductant diimide, offers an operationally simple and atom-economical platform, but its synthetic reach has been fundamentally constrained by the thermodynamic window of diimide and its propensity for unproductive self-decomposition. Electron-rich heterocycles such as furans, whose reduction potentials lie well beyond the reach of conventional diimide chemistry, have consequently remained inaccessible to this strategy.

Here we demonstrate that merging reductive hydrazine chemistry with alternating polarity electrolysis dissolves this barrier. Rapid polarity switching synchronizes diimide generation and furan radical anion formation at a single electrode interface, enabling a kinetically accessible radical anion–diimide coupling pathway. The strategy achieves 2,3-selective partial reduction of furans and benzofurans under mild conditions, suppresses electrode passivation, and obviates super-stoichiometric reductant loadings. Combined electroanalytical, spectroscopic, and computational studies established the mechanistic underpinning of this reactivity, positioning alternating polarity electrolysis as a transformative tool for expanding the synthetic frontier of hydrazine-based reductive chemistry.

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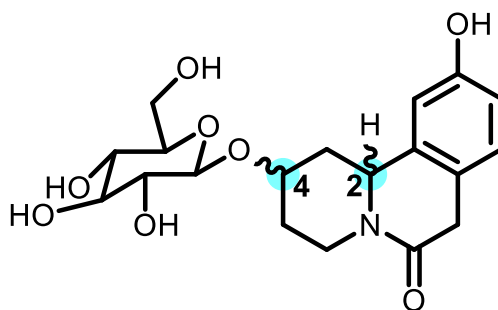
Toward the Total Synthesis of Securingine K

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Securinega alkaloids are a class of alkaloids that have unique bridged tetracyclic structures that display a wide range of biological activity. Several of the securinega alkaloids have been isolated from *Flueggea suffruticosa*, a plant that is ubiquitous in the Korean peninsula.^[1] Based on many isolation campaigns, one of the largest families of securinega alkaloids is high oxidation-state securinega alkaloids that are oxygenated at the C4 position of the securinine A-ring. Several members of this class currently have established syntheses.^[2] Recently, securingine K was isolated as a new member of this family and represents an intriguing target due to the unique C4 O- β -D-glucopyranoside motif. However, the stereochemical assignment of securingine K, particularly at the C2 and C4 position remains unknown. Therefore, this project aims to resolve the C2/C4 stereochemical ambiguity through the chemical synthesis of the possible diastereomers followed by direct spectroscopic comparison with the isolated natural product.



securingine K

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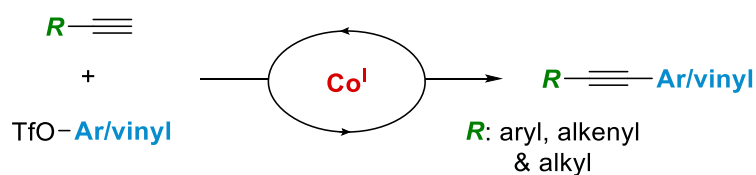
Cobalt-Catalyzed Sonogashira Coupling with Aryl Triflates

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The Sonogashira coupling is a key transformation for C(sp)–C(sp²) bond formation, but conventional Pd/Cu-catalyzed protocols suffer from high catalyst cost and competing side reactions. We report a cobalt-catalyzed coupling of aryl triflates and terminal alkynes that offers a sustainable alternative with broad substrate scope. Mechanistic investigations suggest a cobalt(I)–acetylide-mediated pathway, distinct from the oxidative-addition-first mechanism typically invoked in traditional Sonogashira reactions. Experimental studies and substrate evaluation highlight both the mechanistic features and synthetic utility of the method.



Synthesis of Tetrahydroquinolines from Imines and Alkenes via [4+2]-Cycloaddition Reaction

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Abstract

Tetrahydroquinolines (THQs) represent important nitrogen-containing heterocycles that are frequently found in biologically active molecules and medicinally relevant scaffolds.^{1,2} Owing to their structural and pharmacological significance, numerous synthetic approaches to THQs have been developed, including Povarov-type reactions, intramolecular cyclizations, and reductive cyclization strategies.³ However, many classical Povarov protocols rely on Brønsted or Lewis acid activation of imines⁴, while radical or electron donor–acceptor-based approaches can suffer from limited substrate scope.⁵ Therefore, the development of mild and broadly applicable synthetic methods for accessing structurally diverse THQ derivatives remains highly desirable. Herein, we report an efficient aza-Diels–Alder-type reaction of imines with styrene derivatives, providing access to a range of THQ scaffolds under mild conditions. The synthetic utility of this protocol was further demonstrated through late-stage functionalization of natural product and drug derivatives.

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Jae Yeon Kim: kimjy0412@dau.ac.kr

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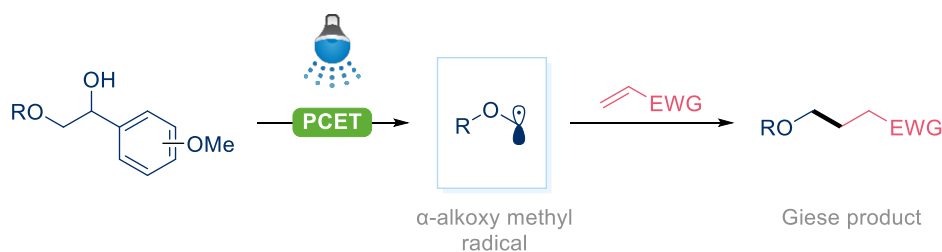
Photocatalytic Giese-Type Addition of α -Alkoxy Methyl Radical Generated from Benzyl Alcohol

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Ether functional groups are commonly found in biologically active molecules and natural products and are useful building blocks in organic synthesis. In our previous work, trimethylsilyl (TMS) groups were used as radical precursors, but this approach was mainly limited to aryl-substituted systems. In this work, we report a visible-light-driven photocatalytic method based on proton-coupled electron transfer (PCET) to generate α -alkoxy methyl radicals from benzyl alcohol derivatives. The resulting radicals undergo Giese-type addition to electron-deficient alkenes, forming C–C bonds efficiently with good functional group tolerance. This reaction also uses a green solvent system and an inexpensive base, providing an environmentally friendly and cost-effective. Overall, it provides a straightforward way to use alcohols as radical precursors and enables the synthesis of ether-containing compounds in a single step.



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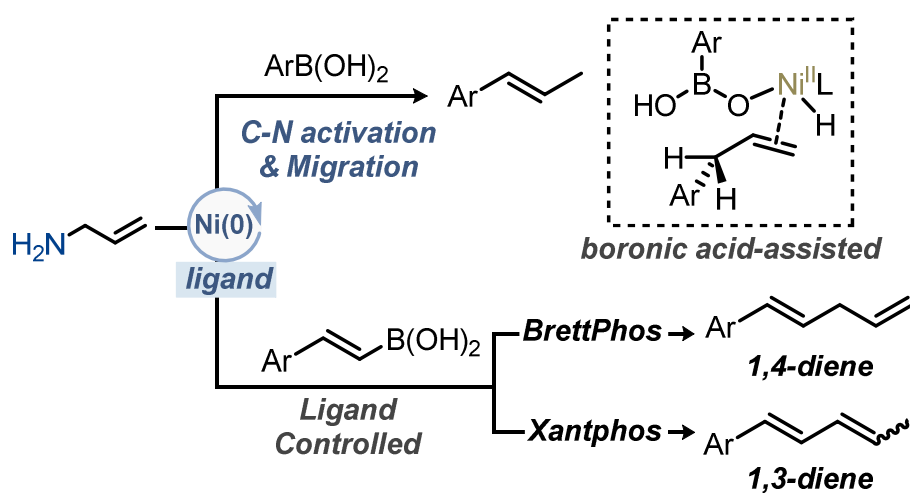
Nickel-Catalyzed β -Methyl Vinylation and Ligand-Controlled Divergent Diene Synthesis via Allylic Amines as Masked Alkenyl Electrophiles

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We report a Ni-catalyzed deaminative coupling/isomerization of allylic amines with arylboronic acids, enabling efficient access to (E)- β -methyl vinylarenes. Notably, allylic amines serve as masked alkenyl electrophiles, thereby bypassing the direct activation of challenging C(sp²)-NH₂ bonds. The reaction proceeds through C-N bond activation followed by nickel-mediated alkene isomerization, providing stereoselective installation of (E)-prop-1-en-1-yl motifs onto aromatic frameworks. Furthermore, this platform was extended to ligand-controlled divergent diene synthesis with styrylboronic acids, selectively delivering conjugated 1,3-dienes or skipped 1,4-dienes from the same allylic amine precursors. This protocol offers a unified strategy for accessing methyl vinylarenes and diverse diene scaffolds from amine-derived electrophile platforms.



Minimal Substituent Engineering of Coumarin– Thiosemicarbazones for Enhanced Fluorescence, Cu²⁺ Detection, and Anticancer Activity

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Fluorescent anticancer agents enable real-time imaging and therapeutic monitoring, thereby facilitating non-invasive cancer treatment. However, many fluorophores still suffer from limitations such as low emission intensity, persistent background fluorescence, and limited biological activity.

Herein, we report the development of a coumarin-based thiosemicarbazone derivative (CT) as a versatile platform for structure–property modulation, which inherently exhibits weak fluorescence. The introduction of a phenyl substituent stabilizes the singlet excited state (S₁) while suppressing non-radiative decay pathways, leading to a significant enhancement in fluorescence quantum yield through increased excited-state rigidity and electronic stabilization.

The paramagnetic metal ion Cu²⁺ (d⁹) facilitates intersystem crossing, electron transfer, and non-radiative decay upon coordination, resulting in efficient fluorescence quenching and a pronounced turn-off response. This coordination-induced quenching enables the selective detection of Cu²⁺ even in the presence of competing metal ions.

Overall, this study demonstrates a simple yet effective molecular design strategy that integrates fluorescence enhancement with metal-ion responsiveness through minimal structural modification, highlighting its potential for anticancer applications. This approach provides a promising foundation for the development of fluorescent agents capable of simultaneous cancer diagnosis and therapeutic monitoring.

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presentation title

Ir(III)-Based Photosensitizer inducing Immunogenic Cell Death via Photodynamic Therapy

Abstract

Photodynamic therapy (PDT) provides a targeted cancer treatment strategy by utilizing photosensitizers (PS) activated by light to generate reactive oxygen species (ROS), effectively inducing cancer cell death. However, conventional PS often face challenges such as limited tissue penetration, insufficient ROS generation, and a narrow scope of induced cell death mechanisms. To overcome these limitations, we developed iridium-based photosensitisers with enhanced ROS production efficiency.

Importantly, our synthetic Ir-PS demonstrated the capability to induce ferroptosis, a programmed cell death pathway associated with strong inflammatory and immunogenic features. Preliminary fluorescence imaging revealed non-apoptotic cell death characteristics, and further biochemical validation is ongoing to elucidate the precise pathways involved. Our research highlights the potential of Ir-based photosensitizers to expand the scope and efficacy of PDT by leveraging ferroptosis, providing a promising route towards more effective and selective anticancer therapies.

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Self-Assembling Nonhomodimeric Cyanine Photosensitizers for Efficient Tumor Targeting and Type I Photodynamic Therapy

Photodynamic therapy (PDT) is a promising cancer treatment, but its clinical application is limited by the hypoxic tumor microenvironment and the poor tumor accumulation of conventional photosensitizers. To overcome the limitations of existing homodimeric designs, this study developed nonhomodimeric cyanine photosensitizers (Cy-Ph and Cy-SPh) optimized for tumor targeting and hypoxia tolerance. By integrating a near-infrared (NIR)-absorbing heptamethine cyanine scaffold with a triphenylaminopyridinium moiety known for excellent reactive oxygen species (ROS) generation, we induced a distinct HOMO-LUMO separation. This dramatically reduces the S_1 - T_3 energy gap, facilitating a robust Type I electron transfer process. In aqueous solutions, Cy-SPh spontaneously self-assembles into nanoparticles of approximately 64 nm, maximizing passive tumor targeting via the enhanced permeability and retention (EPR) effect. Upon 808 nm laser irradiation, the assemblies generated substantial amounts of highly cytotoxic superoxide anions ($O_2^{\bullet-}$) and hydroxyl radicals ($\bullet OH$), successfully overcoming conventional oxygen dependency. Furthermore, the inherent positive charge of the molecules enabled specific mitochondrial targeting, inducing membrane depolarization and apoptosis in 4T1 cells. In vivo experiments demonstrated that tumor accumulation peaked 12 hours post-intravenous injection, and subsequent laser irradiation led to significant tumor growth inhibition without systemic toxicity. In conclusion, this study demonstrates that nonhomodimeric molecular engineering is a highly effective and practical strategy for developing self-assembling, hypoxia-tolerant photosensitizers.

Title	Mn(I)-Catalyzed C–H Dienylation/Cycloaddition Cascade of Indoles for Access to Alicyclic Heteroarene Scaffolds
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Affiliations	¹ Department of Chemical Engineering (BK21 FOUR Graduate Program), Dong-A University, Busan ² Division of Physiology, Departments of Oral Biology and Applied Biological Science, BK21 FOUR, Yonsei University College of Dentistry, Seoul ³ Department of Chemistry, Dong-A University, Busan
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Abstract	
The efficient construction of alicyclic frameworks on heteroarenes remains an important challenge in synthetic and medicinal chemistry. We report a Mn(I)-catalyzed C–H dienylation/[4+2] cycloaddition cascade that provides rapid access to cyclohexene-fused indoles from substituted indoles and allenyl benzoates. The reaction proceeds through C2-selective dienylation of indoles, followed by single-flask cycloaddition with diverse dienophiles to afford structurally complex fused products. Mechanistic studies support a catalytic pathway involving reversible C–H activation and manganacycle formation. Preliminary biological evaluation reveals that selected indole–cyclohexene products demonstrate anti-inflammatory activity. This work demonstrates a concise and modular strategy for converting simple heteroarenes into biologically relevant alicyclic scaffolds.	

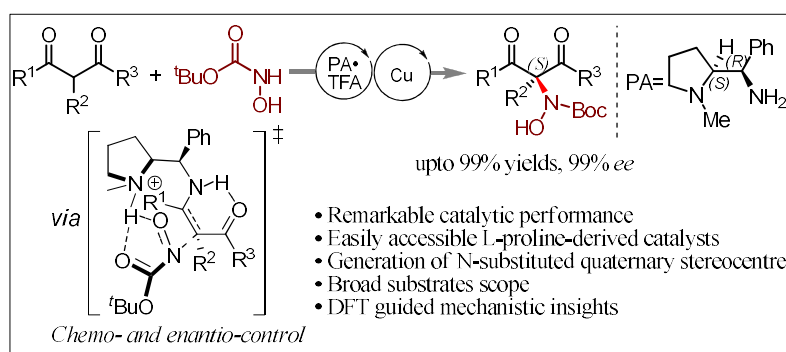
Highly Chemo- and Enantioselective α -Amination of Branched β -Ketocarboxyls Enabled by L-Proline-Derived Primary Amine/Copper Dual Catalysis

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Abstract: Catalytic enantioselective α -amination of sterically congested β -ketocarboxyl compounds remains a major challenge in asymmetric synthesis, largely because of competitive O-amination, uncatalyzed nitrosation pathways, and insufficient stereocontrol during quaternary stereocenter construction. Herein, we report an L-proline-derived chiral primary amine catalyst platform that enables highly chemo- and enantioselective α -amination of α -branched β -ketoesters and related β -ketocarboxyl frameworks. Under mild and operationally simple conditions, in situ-generated nitrosocarbonyl electrophiles serve as effective nitrogen-transfer reagents, delivering α -aminated products in excellent yields of up to 99% and enantioselectivities of up to >99% ee across a broad range of sterically demanding substrates. Mechanistic investigations, supported by DFT calculations, suggest that a compact and preorganized catalyst scaffold facilitates cooperative dual activation by accelerating enamine formation while simultaneously positioning the nitrosocarbonyl partner through hydrogen-bonding interactions. This well-defined chiral environment controls the approach to the forming quaternary center and suppresses both undesired O-functionalization and nonselective background reactions, thereby accounting for the observed high N-selectivity and enantioinduction. In addition to nitrosocarbonyl-based amination, this catalyst class is also effective in α -amination using azodicarboxylates, providing products with high yields and enantioselectivities. The resulting α -aminated compounds represent valuable synthetic intermediates for accessing α -quaternary amino acids and other pharmaceutically relevant nitrogen-containing scaffolds.



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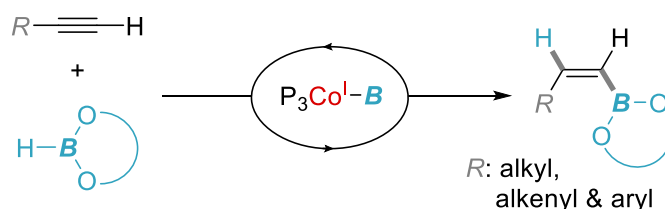
Cobalt-Catalyzed (Z)-Selective Hydroboration of Terminal Alkynes

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Access to disubstituted (Z)-vinylborons remains challenging because conventional *syn*-hydroboration of terminal alkynes inherently favors alternative stereochemical outcomes. Mechanistically, despite the growing prominence of cobalt catalysis in (Z)-alkyne hydroboration, most reported systems operate through cobalt–acetylide pathways,^[1,2] whereas cobalt–boryl pathways remain largely unexplored. In this poster, we report a cobalt-catalyzed (Z)-selective hydroboration of terminal alkynes enabled by a modular phosphine ligand framework. Cooperative ligand effects generate active cobalt–boryl species that facilitate sequential borylation and isomerization, affording an efficient route to stereodefined C–B bonds. Mechanistic and computational studies support a Crabtree–Ojima-type isomerization pathway.



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BIAS-FREE HIGHLY EFFICIENT AND STABLE DYE-SENSITIZED PHOTOELECTROCHEMICAL CELLS VIA CASCADE CHARGE TRANSFER

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Dye-sensitized photoelectrochemical cells hold promise for artificial photosynthesis but face challenges such as low photocurrents and limited stability. To address these limitations, a cascade-type dye-sensitized photoelectrode is developed by encapsulating a dye-sensitized TiO₂ layer and redox mediator within platinum-sputtered nickel foil. This buried-junction design enables spatially controlled cascade charge transfer, featuring effective photoconversion and Ni-catalyzed water oxidation, while suppressing undesirable recombination current leakage. Through a comprehensive study involving the selection of redox mediators and water oxidation catalysts, the best-performing photoelectrode for water splitting achieves a photocurrent of 14.0 mA cm⁻² at 0.72 V vs. reversible hydrogen electrode (RHE), a Faradaic efficiency of 98%, and photostability of 30 hours. Moreover, the versatility of our design extends to bias-free H₂O₂ production, achieving a photocurrent density of 7.83 mA cm⁻², a Faradaic efficiency of 92.2%, and a record-high solar-to-fuel efficiency of 4.15% (2.13 μmol min⁻¹ cm⁻²), with photostability of 150 hours.

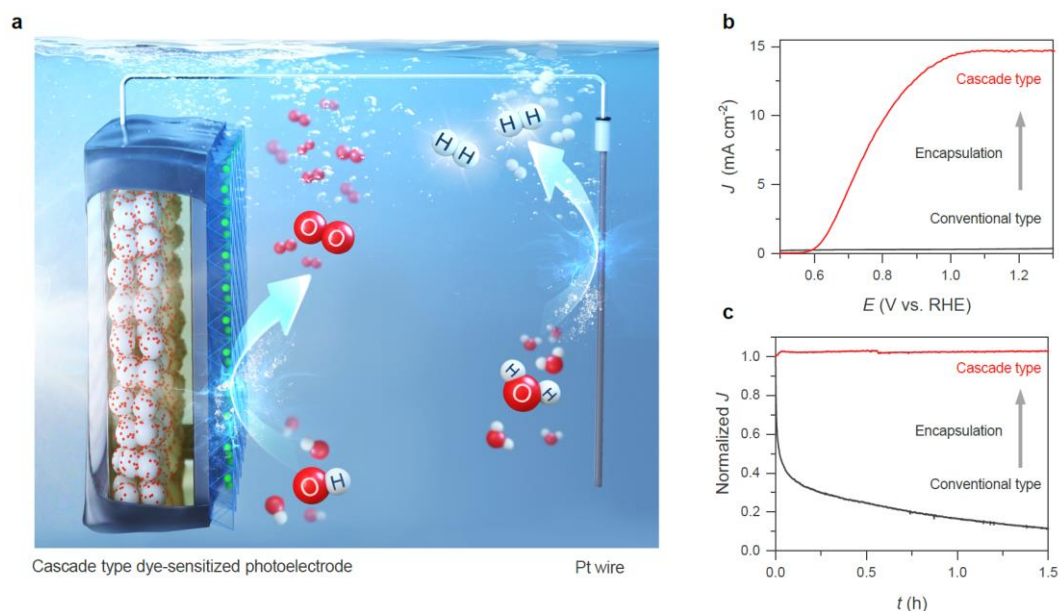


Figure 1. Comparison of conventional-type and cascade-type DSPECs. (a), Schematic representation of a cascade-type DSPEC. **(b,c)** Comparison of water splitting between conventional- (black) and cascade-type (red) DSPECs under AM 1.5G 100 mW/cm² sunlight: photocurrent (b) at a scan rate of 10 mV/s and photostability (c) at 1.23 V vs. RHE.

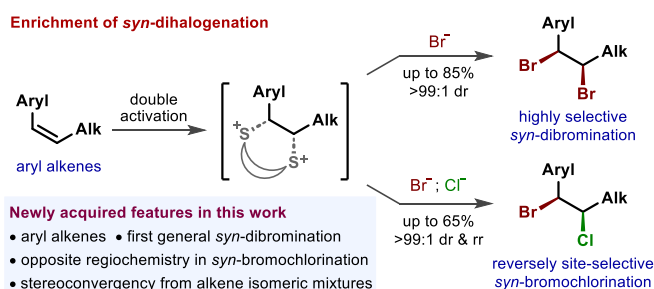
Enriching Alkene *syn*-Dihalogenation: Aryl Alkene, Bromine, Regio-reversion, and Stereoconvergency

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Alkene dihalogenation is widely utilized for organohalide synthesis as an indispensable synthetic tool. Ironically, the nearly perfect *anti*-diastereospecificity becomes a formidable hurdle when the other *syn*-diastereochemical course is desired.¹⁻² Thus, accessing the uncharted half of the stereochemical space has been an intriguing synthetic challenge. Despite the recent advancements in *syn*-dihalogenation, there still remain critical problems to be resolved such as notorious unsuitability of aryl alkenes and low stereospecificity of dibromination.³ Herein, both of these issues are successfully addressed via our vicinal double electrophilic activation strategy to enable the development of a highly stereoselective *syn*-dibromination of aryl alkenes for the first time. Moreover, the use of two different halogens leads to unusual site-selectivity that is inaccessible via the traditional methods. Furthermore, the complementary behavior of the alkene geometrical isomers allows for a rare type of stereoconvergent dibromination from *E/Z* mixtures. As a result, our work provides a number of enriching features to this important yet young research field.⁴



Scheme 1. *syn*-dibromination and reversely site-selective *syn*-bromochlorination of aryl alkenes

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포스터 발표

Radical-Mediated Esterification Using Molecular Oxygen and Triethylborane

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Esters play a crucial role as key intermediates in the chemical, pharmaceutical, cosmetic, food, and polymer industries. Therefore, numerous esterification methods have been developed; however, many conventional approaches require strong acidic conditions, limiting their applicability to acid-sensitive substrates. Although alternative strategies that avoid strong acids have been developed, they often depend on expensive catalysts or specialized reagents. In this context, the development of radical-mediated esterification has attracted increasing attention due to its high reactivity and selectivity under mild reaction conditions. However, most methods reported to date have relied on photochemical activation. Herein, we report a novel radical-mediated esterification of carboxylic acids using trialkylboranes and molecular oxygen (O₂). This method enables efficient esterification of a broad range of carboxylic acids, including substrates bearing α -chiral stereogenic centers.

Nickel-Catalyzed Asymmetric C(sp³)–C(sp³) Cross-Electrophile Coupling of Unactivated Alkyl Halides to Access α -Chiral Carbinols

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Cross-electrophile coupling (XEC) has emerged as a powerful platform for constructing C–C bonds directly from two electrophilic partners, bypassing the need for preformed organometallic reagents. However, the stereoselective formation of C(sp³)–C(sp³) bonds by XEC remains a formidable challenge, and catalytic asymmetric variants are still rare.¹

Herein, we report a nickel-catalyzed asymmetric XEC reaction between unactivated alkyl halides and prochiral secondary alkyl halides.² This transformation proceeds with high chemo- and enantioselectivity under mild conditions, affording the desired coupling products in up to 88% yield and 95% ee. The method exhibits broad substrate scope and tolerates diverse functional groups, including esters, amides, ketones, borates, and free alcohols. Moreover, the resulting products can be readily converted into α -chiral carbinols, providing streamlined access to valuable chiral motifs found in pharmaceuticals, bioactive compounds, and natural products.

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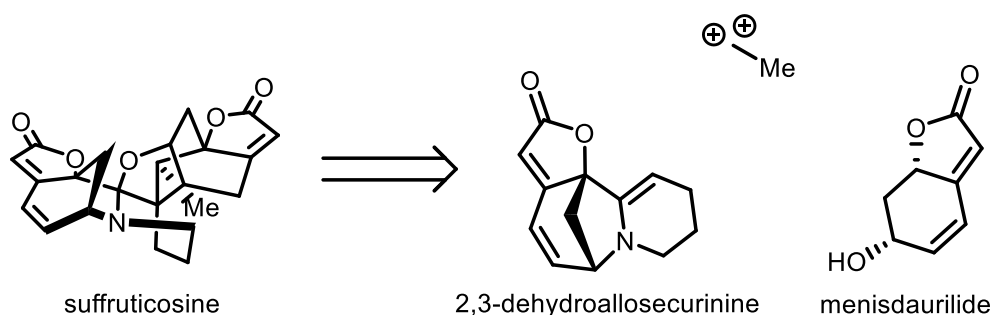
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포스터 발표

Studies toward the Synthesis of SuffruticosineMinju Kang, Taewan Kim, Sunkyu Han**Department of Chemistry, Korea Advanced Instituted of Science and Technology*

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Securinega alkaloids are a class of natural products characterized by a tetracyclic core and remarkable structural diversity. Among them, suffruticosine features a highly oxidized and complex octacyclic ring system derived from an allosecurinine scaffold.^{[1],[2]} In this work, we propose a new synthetic strategy toward suffruticosine based on the fundamental structural framework of 2,3-dehydroallosecurinine. Using a simplified system lacking a methyl group, we successfully optimized the reaction conditions for construction of the core framework via linkage of two key fragments through a one-carbon bridge, followed by sequential 1,6-addition and intramolecular C–O bond formation. Furthermore, we explored the application of a highly reactive two-carbon moiety to ultimately advance the synthesis of suffruticosine based on the optimized synthetic strategy.

**Figure 1** Retrosynthetic strategy of suffruticosine**Reference**

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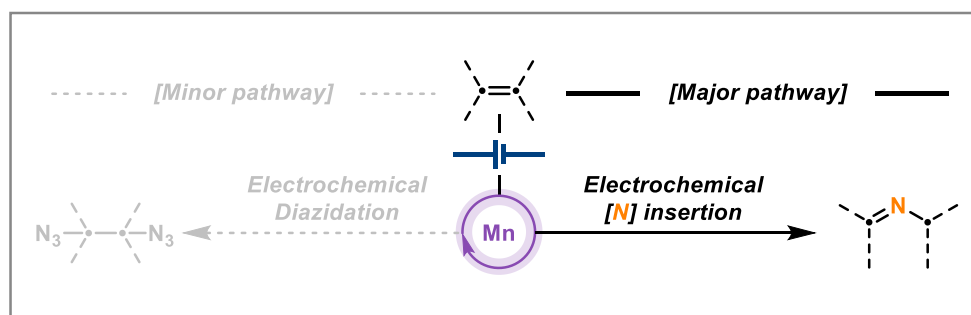
포스터 발표

Electrochemical Nitrogen Atom Insertion Enabled by a Manganese Complex

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While skeletal editing has recently emerged as a groundbreaking platform for late-stage molecular reconstruction,^[1] nitrogen insertion still largely relies on stoichiometric oxidants or pre-oxidized precursors, strategies to address this challenge remain underdeveloped. In this study, we developed a manganese-catalyzed electrochemical nitrogen-atom insertion reaction with azides. A manganese complex serves as an effective platform for controlling azide reactivity, in which an *in situ* generated Mn(II)–N₃ species undergoes electrooxidation to form an azide radical, leading to nitrogen-atom insertion rather than well-established diazidation.^[2] To elucidate the origin of this reactivity, detailed mechanistic studies, including cyclic voltammetry, potential-dependent kinetic analysis, controlled potential electrolysis, and radical clock experiments, were conducted.^[3] These findings highlight not only the key role of the manganese complex in modulating electrochemical azide reactivity but also the synthetic utility of electrocatalytic skeletal editing for constructing nitrogen-containing heteroaromatic architectures with broad functional group tolerance.



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Interfacial Engineering for Efficient and Stable Blue Perovskite Light-Emitting Devices via Triplet Confinement and Defect Passivation

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Perovskites are highly attractive materials for optoelectronic applications, with extensive research focusing on their use in solar cells due to their exceptional optoelectronic properties. Recently, perovskite light-emitting devices (PeLEDs) have garnered significant interest for their narrow emission full width at half maximum (FWHM) and high tunability. However, the stability of blue PeLED remains a major challenge, PeLED shows significantly lower stability than the other light-emitting devices. Triplet exciton leakage from the emitting layer is one of the primary causes of this instability. Such leakage increases non-radiative recombination and induces unwanted reactions, leading to efficiency loss and reduced stability.

This study aims to enhance PeLED stability and efficiency by employing a triplet confinement strategy to prevent exciton leakage from the emitting layer to the hole transport layer (HTL). To achieve this, we develop an electron blocking layer (EBL) material with a high triplet state energy by designing a highly twisted molecular structure. Additionally, we screen functional groups to achieve an energy level alignment and surface passivation. By introducing functional groups to the EBL molecule, we modulate its energy level to enhance hole transport ability through energy level alignment. Moreover, we expect that introducing these functional groups will improve the interaction between the perovskite emission layer and the interfacial layer, leading to better surface passivation. In this presentation, we demonstrate the effectiveness of this strategy and explore how functional group tuning influences photophysical properties.

Keywords:

Perovskite, Triplet Confinement, Defect Passivation, Electron Blocking Layer, Light-Emitting Device

포스터 발표

Activation-Reactivity Inversion in Au(I)-Complex-Photocatalyzed Borylation of Aryl Chlorides

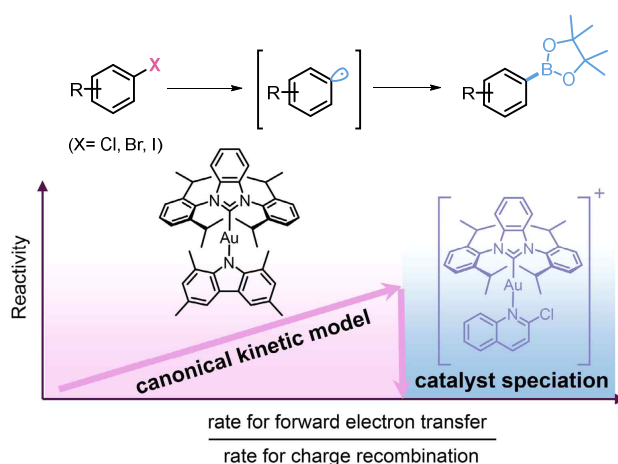
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Photocatalytic activation of aryl chlorides remains challenging because productive bond cleavage requires both strong photoreducing power and suppression of unproductive back-electron transfer. Here we report a linear two-coordinate Au(I) complex that photocatalyzes aryl chloride borylation and quantitatively analyze the kinetic factors governing reactivity. For most substrates, catalytic efficiency increased with the rate of photoinduced electron transfer and decreased with geminate charge recombination, consistent with typical photoredox kinetics. In contrast, Lewis basic N-heteroaryl chlorides were inactive despite favorable electron-transfer kinetics. Spectroscopic, mass spectrometric, and computational studies showed that these substrates coordinate to Au(I), induce ligand substitution, and generate catalytically inactive species. These findings demonstrate that substrate-induced catalyst speciation can override intrinsic photoredox driving force and identify coordination robustness as a key design principle for activating strong bonds.



**A New Synthesis method of Weinreb Amides and their analogs
with α -Effect Nitrogen Nucleophiles**

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Weinreb amides are important synthetic intermediates that effectively suppress the over-addition of organometallic reagents, enabling selective access to ketones and aldehydes. Traditionally, Weinreb amides are synthesized from carboxylic acid derivatives. Here, we report a complementary strategy that employs α -oximino ketones as unconventional starting materials for their synthesis. This approach involves a subsequent N-O and C-C bond cleavage followed by C-N bond formation to construct the Weinreb amide synthesis. The method exhibits broad substrate scope applicable to both linear and cyclic aryl and alkyl ketones, providing a practical approach for the efficient synthesis of Weinreb amides.

Design and Synthesis of homoleptic iron(II) complex with Tris(Pyridyl-Triazolylidene) Ligands for New Photocatalyst

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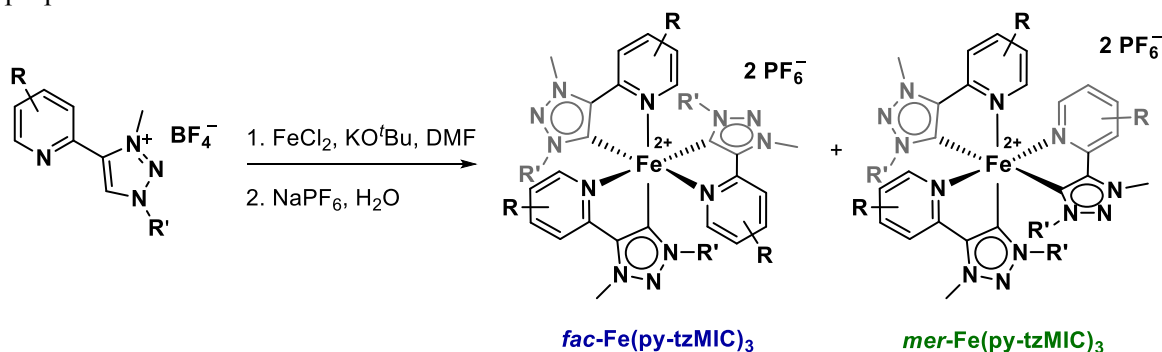
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Abstract

Iron is an attractive alternative to noble-metal photocatalysts such as iridium and ruthenium, because it is abundant and low-cost. However, developing Fe photocatalysts is challenging because Fe excited states often deactivate rapidly: the MLCT (metal-to-ligand charge transfer) state rapidly relaxation to MC (metal-centered) states, leading to short excited-state lifetimes.¹

To overcome this limitation, we focus on two key approaches. First, stronger ligand fields can be achieved using strong σ -donating or π -donating ligands, which can stabilize the MLCT state and destabilize MC states. As one example, an $\text{Fe}(\text{btz})_3^{2+}$ (bis-triazolylidene) complex prepared using a strongly σ -donating MIC (mesoionic carbene) ligand has been reported to extend the excited-state lifetime up to 528 ps.² Second, fac/mer control can influence excited-state deactivation; in some systems, the fac isomer can show longer lifetimes than the mer isomer,³ because its higher symmetry may improve metal–ligand orbital overlap and can require larger structural distortion for MLCT→MC conversion.

In this work, we designed a new bidentate ligand that combines a pyridyl group (good π -acceptor) with an triazolylidene group (good σ -donor, MIC) to access Fe(II) complexes with potentially longer excited-state lifetimes for photocatalysis. We investigated how substituents on the pyridyl and triazolylidene units and reaction temperature affect the fac/mer ratio during synthesis. The resulting complexes were characterized by absorption and emission spectroscopy and CV (cyclic voltammetry) to estimate excited-state oxidation potential (E_{ox}^*) and to compare their photocatalyst-relevant properties.



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BR₃/O₂-Promoted Peroxidation of Aldehydes for the Synthesis of Geminal Bisperoxides

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Organic peroxides constitute an important class of compounds in natural products, medicinal chemistry, and industrial applications. The clinical significance of artemisinin and the reported antimalarial and anticancer activities of bisperoxide-containing molecules have further stimulated interest in the synthesis of O–O bond-rich structures. Nevertheless, access to bis(alkyl peroxides) commonly relies on stepwise protocols involving the independent preparation of hydroperoxide reagents followed by condensation with carbonyl compounds, while hydroperoxide-free approaches remain comparatively limited.

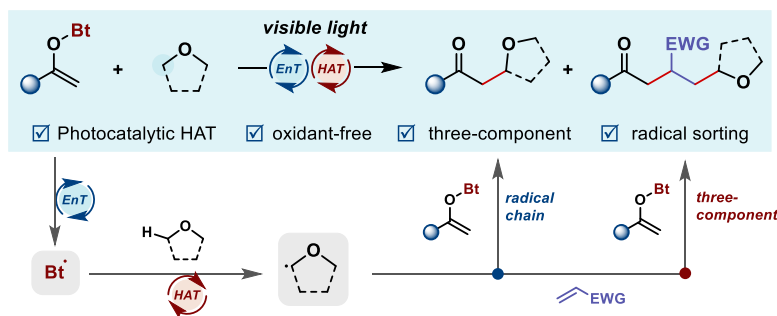
Herein, we report a BF₃·OEt₂-promoted aldehyde peroxidation using trialkylboranes and molecular oxygen. In this reaction, peroxide species are generated in situ from the trialkylborane/O₂ system, providing access to symmetrical geminal bis(alkyl peroxides) from aldehydes. A range of aromatic, heteroaromatic, and aliphatic aldehydes were converted to the corresponding products in high yields, up to 99%. Radical-trapping experiments confirmed the involvement of radical species in this transformation.

Benzotriazolyl Radical-Mediated C(sp³)-H Functionalization under Visible-Light Irradiation

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Photocatalytic hydrogen atom transfer (HAT) is gaining interest as a versatile strategy for the functionalizing C(sp³)-H bonds.¹ We recently found that visible-light induced homolytic cleavage of the N-O bond in *N*-enoxybenzotriazole generates benzotriazolyl (Bt) radicals.² The Bt radical is difficult to access via direct oxidation of Bt-H ($E_{\text{ox}}^{\circ} = 2.20$ V vs. SCE). Thus generated Bt radicals were developed as HAT agents for the functionalization of ethers at its α C(sp³)-H bond. Notably, the transformation proceeded without the need for excess oxidants. Instead, benzotriazolyl radical, having strong N-H bond (BDE = 108 kcal/mol),³ abstracts hydrogen atom from ethers to generate α -alkoxy radicals as a radical chain carrier. Alternatively, electron-deficient alkenes may interrupt the chain propagation, leading to two successive C-C bonds. A diverse range of ethers and non-etheral coupling partners were demonstrated, and the detailed mechanistic studies were provided to support the mechanistic underpinning.



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Ascorbic acid 2-phosphate (AAp) as a Selective Therapeutic Agent against ALP-Overexpressing Cancer Cells

Alia Huwaida Raharja and Beom Jin Kim

The presenter's name : Alia Huwaida Raharja

The presentation title : Ascorbic acid 2-phosphate (AAp) as a Selective Therapeutic Agent against ALP-Overexpressing Cancer Cells

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Abstract:

Ascorbic acid 2-phosphate (AAp) is a stable derivative of ascorbic acid (AA) that can be converted into AA through alkaline phosphatase (ALP)-mediated dephosphorylation. Since several cancer cell lines exhibit high ALP expression, this study investigated the potential of AAp as a selective ROS-generating anticancer agent in ALP-overexpressing cancer cells. Upon dephosphorylation in high ALP-expressing cell lines, AAp restored the pro-oxidant activity of ascorbic acid and promoted the generation of hydrogen peroxide (H_2O_2) and hydroxyl radicals ($\bullet OH$) in the presence of metal catalysts. The elevated intracellular ROS levels were associated with DNA damage and mitochondrial dysfunction, which resulted in selective inhibition of cancer cell viability. This study demonstrates a novel enzyme-activated ROS-based strategy for selectively targeting ALP-overexpressing cancer cells.

Alkaline Phosphatase-Triggerred Redox Degradation of PA-Fe(III) Thin Films for Cells Selective Dissociation

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The presenter's name : Rizka Karlina Wulandari Fauzan

The presentation title : Alkaline Phosphatase-Triggerred Redox Degradation of PA-Fe(III) Thin Films for Cells Selective Dissociation

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Alkaline phosphatase (ALP)-responsive materials have attracted increasing attention for smart biomaterial and surface engineering applications because ALP is overexpressed in several pathological conditions. In this study, phytic acid-Fe(III) (PA-Fe(III)) coordination thin films were fabricated on silicon substrates through layer-by-layer (LbL) assembly method, and their degradation behavior under ALP-triggerred redox conditions was investigated. Ascorbic acid-2-phosphate (AAP) was selected as an ALP-responsive precursor because it can be dephosphorylated by ALP to generate ascorbic acid (AA), which acts as a reducing agent. The generated AA was expected to reduce Fe(III) into Fe(II), thereby weakening the coordination interaction within PA-Fe(III) network and inducing dissociation of the coordination network. Upon AAP treatment, selective cell detachment was observed for ALP-overexpressing cell lines (HeLa and Saos-2), while low-ALP cell lines (MCF-7 and MRC-5) showed minimal changes. These results suggest that endogenous ALP activity can influence the stability of PA-Fe(III) films through redox-triggerred degradation. This study presents a new strategy for enzyme-responsive and cell-selective surface dissociation and smart biointerface applications using metal-organic coordination thin films.

Visible Light-Mediated Enantioselective Addition Reaction of α -Alkoxyalkyl and α -Thioalkyl Radicals to Aldehydes Catalyzed by Chiral Oxazaborolidinium Ion

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Visible light-mediated enantioselective catalytic synthesis is major issue in the recent organic synthesis research.¹ It is frequently known that α -aminoalkyl radicals derived from α -silyl amines are used as excellent photogenerated radicals for various visible light-mediated enantioselective organic reactions such as 1,4-conjugative additions or 1,2-additions. In case of 1,4-conjugative additions, α -alkoxyalkyl radicals derived from α -silyl ethers were introduced as novel photogenerated radicals. However, enantioselective catalytic 1,2-addition of α -alkoxyalkyl radicals via visible-light photoredox initiated catalysis has not yet been reported.² Herein, we successfully developed the first example of enantioselective catalytic 1,2-addition of photogenerated α -alkoxyalkyl radicals to aryl aldehydes using visible light source under presence of chiral oxazaborolidinium ion catalysts (COBI). Our research provides desired β -hydroxy ethers and thioethers with high yields (up to 93%) and high enantioselectivities (up to 91% ee). Variety of α -silyl ethers and thioethers were used as scope for 1,2-addition photogenerated radical substrates. Chiral β -hydroxy ethers and thioethers were obtained with relatively poor yields (up to 67%) from α -silyl ether with electron donating groups. In contrast, it is obtained with good yields (up to 93%) from α -silyl ethers and thioethers with electron withdrawing groups. The overall enantioselectivities of chiral benzylic alcohols were good (up to 91% ee) regardless of the functional groups attached to the reacting α -silyl ethers.

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Synthesis of Chiral Allylsilanes through Copper-Catalyzed Silylboration of Alkyl- or Aryl-Substituted Buta-2,3-dien-1-ols

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The direct construction of complex chiral architectures bearing both silicon and boron functionalities is of great interest in asymmetric synthesis. While allylsilanes are fundamental building blocks, the enantioselective synthesis of α -borylmethyl-allylsilanes directly from allenes remains largely unexplored. The primary hurdle lies in controlling the enantio-determining step due to competing chemo-, regio-, and stereoselective pathways inherent to allene functionalization.

To address this challenge, we developed a copper-catalyzed enantioselective three-component silylboration of readily accessible 1-alkyl- and aryl-substituted buta-2,3-dien-1-ols using silylboron reagents. The use of a chiral phosphine ligand proved crucial for achieving efficient stereocontrol while suppressing undesired side reactions. This catalytic system provides the corresponding (*E*)- α -borylmethyl allylsilanes with excellent regioselectivity, high enantioselectivity, and broad functional-group compatibility under mild reaction conditions. The method exhibits a broad substrate scope and is readily scalable, as demonstrated by gram-scale synthesis without erosion of enantiopurity. This practical and scalable strategy offers an efficient platform for the synthesis of structurally diverse chiral organosilicon and organoboron compounds.

Studies Toward the Divergent Total Synthesis of Piperazine Alkaloids

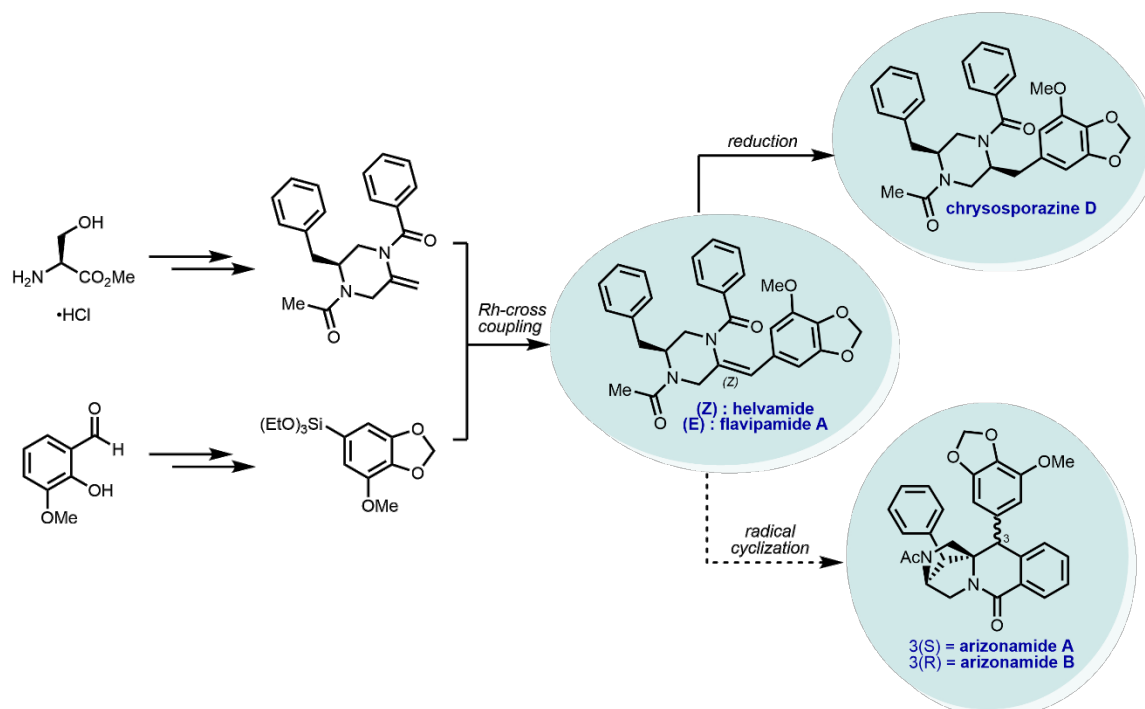
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Piperazines are prevalent motifs in biologically active compounds and pharmaceuticals, and fungi are prolific producers of piperazine alkaloids. In 2024, the Lin group reported the discovery and biosynthesis of arizonamides and proposed that helvamide undergoes non-heme iron enzyme-catalyzed radical cyclization to form the arizonamide core.^[1]

Herein, we report a synthetic strategy toward the divergent total synthesis of piperazine alkaloids. A terminal alkene-containing piperazine core was synthesized from L-serine methyl ester hydrochloride, while a silane-containing aryl fragment was prepared from *o*-vanillin. Rhodium-catalyzed cross-coupling enabled the synthesis of helvamide and flavipamide A as *E/Z* olefin isomers.^[2,3] Subsequent hydrogenation enabled access to chrysosporazine D, and further functional group manipulations are expected to provide diverse piperazine alkaloids. In addition, studies toward biomimetic radical cyclization for the synthesis of arizonamides are currently in progress.



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Cross-Linking Small-Molecule Additives as Mechanistic Modulators in Polydopamine Formation

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Polydopamine (PDA) coatings, inspired by mussel-derived catechol chemistry, have been widely utilized for universal surface modification owing to their robust and substrate-independent adhesion.^[1] Despite their versatility, achieving precise control over dopamine oxidation pathways and subsequent film growth remains a significant challenge. From an organic chemical perspective, these processes involve complex sequences of catechol oxidation, quinone formation, and subsequent covalent and noncovalent coupling reactions.^[2]

In this study, we investigate how small-molecule additives influence the reaction mechanism of dopamine oxidation and the resulting polymerization behavior. Selected additives are introduced to modulate key elementary steps, including catechol-to-quinone conversion, radical generation, and intermolecular coupling pathways. Mechanistic analysis suggests that certain additives act as redox mediators or nucleophilic partners, thereby accelerating oxidation kinetics and redirecting reaction intermediates toward more efficient film-forming pathways.^[3] Additionally, these additives influence supramolecular organization through secondary interactions, contributing to variations in film thickness and morphology. This mechanistically informed approach demonstrates that molecular additives can serve as effective tools for controlling both the chemical pathways and material outcomes of PDA formation, providing a foundation for the rational design of advanced catechol-based coating systems.

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A Lifetime Window into Lipid Dynamics in Alzheimer's Disease

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Aberrant lipid metabolism is increasingly implicated in the pathogenesis of Alzheimer's disease (AD), yet its spatiotemporal visualization within the brain microenvironment remains a formidable challenge. Herein, we report a molecular engineering strategy that enhances the zwitterionic-neutral isomerization sensitivity of the rhodol scaffold, yielding a new generation of isomerization-driven rhodol fluorophores with finely tunable fluorescence lifetimes. Through stepwise heteroatom and heterocyclic modulation (**P-SRd**, **P-PRd**, **P-SiRd**, and **Q-SiRd**), the isomerization efficiency and charge-transfer distance were systematically optimized, as supported by theoretical calculations. Among them, the best-performing candidate, **Q-SiRd**, exhibited exceptional responsiveness to micro-polarity fluctuations, enabling fluorescence lifetime imaging (FLIM) of lipid dynamics in living cells and AD mouse brain tissues. **Q-SiRd** precisely monitored polarity variations within lysosomes and lipid droplets under drug stimulation and during cellular senescence, and further unveiled microenvironmental remodeling associated with AD progression. The key findings include: (i) observation of lipid droplet formation within regions of A β ₄₂ plaque deposition; (ii) lipid droplet accumulation adjacent to these plaques induced a notable increase in fluorescence lifetime, indicative of decreased local micro-polarity; (iii) progressive increases in fluorescence lifetime were observed in the hippocampus and cerebral cortex as the disease advanced. These findings establish **Q-SiRd** as a powerful lifetime-resolved probe for mapping lipid metabolic alterations, advancing our understanding of organelle interplay and metabolic remodeling in neurodegenerative disorders.

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포스터 발표

Manipulating the Degradation of Cyanoarene-based Photocatalysts for the Enhanced Photocatalytic Halogen-Atom-Transfer Reaction

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The controlled degradation of cyanoarene-based photocatalysts (PCs) has emerged as a powerful strategy to enhance photoinduced catalysis. 3DP-DCDP-IPN, a previously reported PC, showed high reactivity due to its rapid photodegradation. Yet, the low oxidating ability of its degraded PC limited its ability to engage with a diverse set of amine donors. To overcome this challenge, we designed new PCs—3DP-Cz-IPN, 2DP-2Cz-IPN 3DP-2Rf₈-Cz-IPN and 2DP-4Rf₈-2Cz-IPN—with tailored electronic properties. 3DP-Cz-IPN showed slower degradation due to its lower oxidation potential yet enabled efficient radical formation when paired with various amines. 2DP-2Cz-IPN underwent rapid degradation, producing 2DP-2Cz-Me-BN, a species capable of forming reactive radical anions with diverse amines. These results demonstrate that structural tuning of PCs offers a versatile platform for modulating degradation kinetics and expanding their applicability in amine-driven radical transformations.

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Mitochondria-Damaging Self-Reporting Probe for Cancer Therapy

Mitochondrial damage induced by chemotherapeutic agents through disruption of the mitochondrial membrane potential remains a central challenge in drug development and evaluation. However, the assessment of these targeting drugs using commercially available fluorescent probes is often unreliable, as exogenous dyes can interfere with or artificially amplify drug-induced dysfunction, leading to a decoupling of fluorescence signaling and actual pharmacological activity. To address this limitation, we developed a class of cationic chemotherapeutic small molecules (DPPs) possessing intrinsic fluorescence migration-based self-reporting capability. Among them, DPP-1 and DPP-2 disrupt mitochondrial function, trigger excessive reactive oxygen species (ROS) generation, and induce highly selective apoptosis via a p53-mediated pathway. Remarkably, both compounds exhibit concentration-dependent mitochondrial-to-nuclear translocation, enabling the real-time visualization of therapeutic progression at the subcellular level. *In vivo* studies further confirm their potent tumor growth inhibition and negligible systemic toxicity effects. Collectively, these findings establish the DPP platform as an effective tool for dynamic subcellular monitoring and selective cancer therapy, offering a highly promising strategy for integrated cancer diagnosis and precision therapy.

포스터 발표

Morphology-Controlled Topochemical Polymerization of β -Peptide Foldamers through Surfactant-Mediated Self-Assembly

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Topochemical azide–alkyne cycloaddition (TAAC) offers a powerful route to triazole-linked peptide-based macromolecules by exploiting the preorganized alignment of azide and alkyne groups in the crystalline state. In our previous study, β -peptide foldamer monomers bearing azide and alkyne termini underwent solid-state polymerization to afford structurally ordered peptide-based macromolecules. However, the resulting polymers exhibited extremely low solubility, which limited post-polymerization characterization and molecular weight analysis. To address this limitation, we herein explore a surfactant-mediated self-assembly system to control the morphology and size of β -peptide foldamer particles prior to TAAC. By varying the surfactant conditions, distinct particle morphologies were selectively obtained, suggesting that the crystallization pathway and supramolecular packing can be modulated at the mesoscale. These particles are expected to retain molecular-level preorganization suitable for TAAC while restricting the effective polymer growth length through size control. The morphology and size of the assemblies were examined by scanning electron microscopy (SEM), while their crystalline features and packing motifs will be investigated by powder X-ray diffraction (PXRD). Subsequent thermal TAAC will be evaluated by infrared spectroscopy (IR), nuclear magnetic resonance (NMR), gel permeation chromatography (GPC), and SEM. This approach may provide a versatile platform for translating peptide foldamer self-assembly into protein-mimetic macromolecular architectures with predictable structural hierarchy.

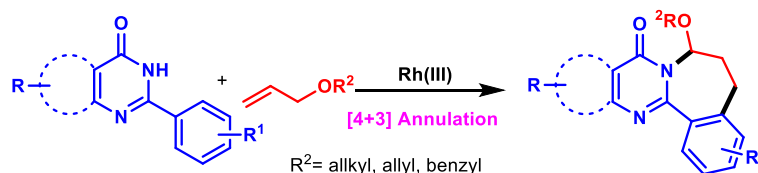
Rh(III)-Catalyzed [4+3] Annulation *via* β -Hydride Elimination for the Synthesis of Fused Azepines

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Abstract

A Rh(III)-catalyzed [4+3] annulation strategy has been developed for the efficient synthesis of heterocycle-fused azepines from 2-arylquinazolines and allyl ethers. The transformation proceeds through sequential C–H/N–H functionalization and involves a unique β -hydride elimination pathway *via* a seven-membered rhodacycle intermediate, thereby suppressing the conventional β -alkoxy elimination route that typically affords six-membered products. Azepines and fused azepine scaffolds are important structural motifs widely found in biologically active molecules, natural products, and pharmaceuticals, exhibiting diverse medicinal properties. This atom- and step-economical protocol provides access to a broad range of functionalized azepines in good yields with excellent substrate tolerance (Scheme 1). The method also enables the incorporation of heteroaromatic and polyaromatic motifs, highlighting its utility for the rapid construction of structurally complex and biologically relevant heterocyclic frameworks.



Scheme 1. Synthetic Strategy for the Synthesis of Heterocycle-Fused Azepines *via* Rh-Catalyzed [4+3] Annulation

Second-Generation Total Synthesis of Securingine G via Photoexcited Nitroarene-Mediated Oxidation

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Securinega alkaloids have long attracted the synthetic community owing to their intriguing molecular architectures and diverse biological activities. In 2024, our group reported the first total synthesis of securingine G¹ via a diastereoselective 1,2-addition of nucleophilic but weakly basic tri(2-pyridinyl)lanthanum complex **1** to electrophilic menisdaurilide derivative **2** (Figure 1). Although this umpolung approach successfully delivered securingine G, the route required a tailored organolanthanum reagent and several post-coupling operations.

Herein, we report that photoexcited triplet-state nitroarenes act as effective dehydrogenation agents for a single-step threefold aromatization of cyclic amine **3** to pyridine **4** under mild, metal-free conditions. The utility of this serendipitously discovered *in situ* pyridine construction is demonstrated in a concise second-generation total synthesis of securingine G.

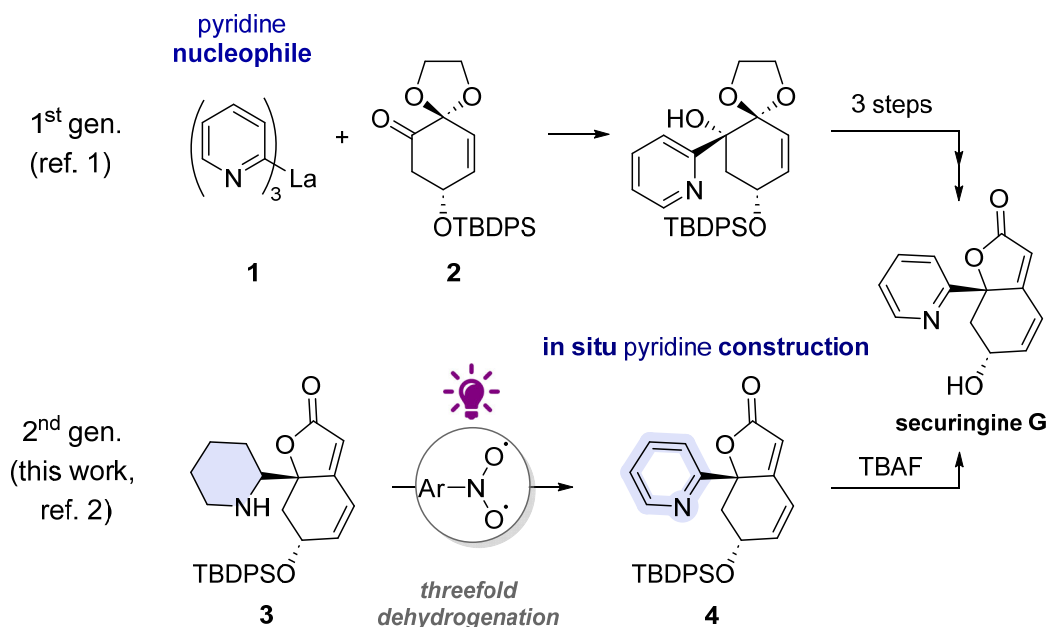


Figure 1. Serendipitous 2nd generation total synthesis of securingine G.

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Title: Development of Lysine-Targeted Proximity Labeling via Peroxidase-Mediated Oxidative Coupling

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Abstract

Proximity labeling has become a powerful strategy for identifying proteins located within specific subcellular environments. Among various proximity labeling platforms, ascorbic acid peroxidase (APEX)-based labeling is particularly useful because it enables rapid, enzyme-catalyzed protein labeling in living systems with high spatial and temporal control. In conventional APEX labeling, biotin-phenol is oxidized by APEX in the presence of hydrogen peroxide to generate short-lived phenoxy radicals, which covalently label nearby proteins within a restricted labeling radius.

Despite its broad utility in spatial proteomics, conventional APEX chemistry mainly relies on the modification of tyrosine residues. This tyrosine preference can limit the chemical diversity of proximity labeling reactions and restrict the types of protein environments that can be efficiently captured. Therefore, expanding APEX-mediated proximity labeling beyond tyrosine residues may provide new opportunities for residue-selective protein labeling and spatial proteomic analysis.

Here, we aim to develop a lysine-targeted proximity labeling strategy based on peroxidase-mediated oxidative coupling. In this approach, phenolic substrates are activated by peroxidase and hydrogen peroxide, generating reactive intermediates capable of coupling with lysine residues. Because lysine residues are abundant and frequently exposed on protein surfaces, lysine-directed labeling may complement conventional tyrosine-based APEX labeling and broaden the accessible protein-labeling landscape.

To establish this strategy, we first evaluate the reactivity of various phenolic substrates toward amine-containing model compounds under horseradish peroxidase (HRP)-mediated oxidative conditions. Selected substrates are further functionalized with bioorthogonal handles to enable downstream fluorescence or affinity-based detection. The labeling efficiency and selectivity of optimized probes are then examined at the protein level using model proteins. Overall, this work seeks to expand the residue scope of peroxidase-mediated proximity labeling and provide a complementary platform for spatially resolved protein analysis.

One-Pot Synthesis of Sulfonyl Fluorides from Pyrimidyl Sulfones under Mild Conditions

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Sulfonyl fluorides have emerged as prominent functional groups across various disciplines, including medicinal chemistry, chemical biology, and materials science, particularly due to their key role in Sulfur(VI) Fluoride Exchange (SuFEx) click chemistry. Consequently, developing facile and robust synthetic methodologies to access structurally diverse sulfonyl fluorides is essential to expand their utility. However, the classical oxidative chlorination–fluorination approach is limited in its substrate scope by the inherent chemical instability of sulfonyl chloride intermediates.¹ Moreover, the reliance on corrosive and hazardous fluoride sources such as KHF₂ presents practical challenges, including potential etching of conventional glassware and reduced compatibility with acid-sensitive functional groups.² To address these limitations, we herein report a mild, safe, and efficient synthetic protocol for the preparation of sulfonyl fluorides starting from pyrimidyl sulfones. This strategy relies on the *in-situ* generation of DMAP-mediated sulfinate intermediates, which undergo concomitant fluorination. Notably, by charging all reagents simultaneously at the outset, this approach eliminates the need for stepwise additions or the isolation of intermediates, demonstrating broad functional group tolerance.

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포스터 발표

A Carbene Relay Strategy for the Construction of Conjugated Amino dienones

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(*E,E*)- $\alpha,\beta,\gamma,\delta$ -unsaturated carbonyl motifs are widely represented in natural products, bioactive molecules and functional organic materials.^[1] Despite significant advances in the synthesis of conjugated dienones,^[2] direct access to dienone scaffolds often require multistep sequences and relatively underexplored.^[3] To address this limitation, our approach enables a one-pot assembly of conjugated amino dienones from readily available *N*-sulfonyl triazoles and allylic alcohols. Herein, we report a Rh(II)-catalyzed carbene relay strategy that proceeds through O–H insertion/[3,3]-sigmatropic rearrangement followed by DBU-promoted elimination/isomerization.

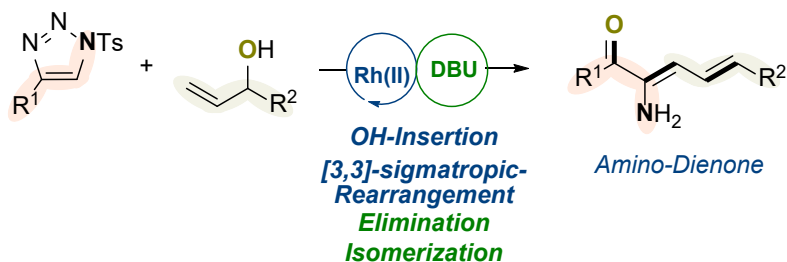


Figure 1

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the presenter's name

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presentation title

A Practical Approach to Organic Nitriles from Dioxazolones via Copper/Organo Dual Catalysis

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abstract

Organic nitriles are invaluable and versatile precursors in the synthesis of pharmaceuticals, agrochemicals, and other biologically relevant molecules. Herein, we present a benzoyl chloride-catalyzed conversion of *N*-acyl iminophosphoranes into structurally diverse organic nitriles. The methodology enables a one-pot synthesis of nitriles directly from dioxazolones via copper/organo dual catalysis and provides efficient access to structurally diverse nitriles, including bioactive scaffolds. Several mechanistic studies, including Hammett study, provide insight into the plausible reaction pathway.

A Novel approach for the Synthesis of Carbamoyl Azides through C–C Bond Cleavage of Carbamoyl Oximes

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Carbamoyl azides are nitrogen-rich intermediates and useful nitrene precursors for the synthesis of ureas, amines, triazoles, and other nitrogen-containing scaffolds. Their conventional synthetic methods often require pre-activated substrates, metal catalysts, or harsh conditions. Herein, we report two complementary one-pot strategies for converting linear carbamoyl oximes and isatin oximes into carbamoyl azides through C–C bond cleavage and azidation, based on the DPPA- or coupling reagent-based reaction systems.

Presentation style: oral () poster (o)
Title: Self-Immolative Activable Nanoassembly Toward Immuni-Photodynamic Therapy in TME
Authors: Yesim Bakan, Dongeun Kim, Goeun Kim, Hyeonji Rha, Eunji Kim, Sumin Kim, Yujin Kim, Jiyoung Yoo, Jiwoo Seo, and Jong Seung Kim
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Abstract: Conventional photosensitizers used in photodynamic therapy (PDT) suffer from poor tumor selectivity and off-target phototoxicity due to their “always-on” activity. To address this limitation, we report a quinone methide (QM)-gated self-immolative nano-photosensitizer platform (Pyz/PS) for hydrogen peroxide (H ₂ O ₂)-activated immuno-photodynamic therapy (IPDT). The amphiphilic receptor Pyz integrates an H ₂ O ₂ -responsive boronate trigger, a QM self-immolative linker, anion-recognition motifs, and a hydrophobic alkyl tail, enabling spontaneous assembly with anionic commercial photosensitizers (TPPS, Eosin Y, and Rose Bengal). In the assembled state, fluorescence and reactive oxygen species (ROS) generation are efficiently quenched via photoinduced electron transfer. Upon exposure to elevated H ₂ O ₂ levels in the tumor microenvironment, the nanoassemblies disintegrate, restoring photosensitizer activity and simultaneously releasing QM species that deplete intracellular glutathione, thereby amplifying oxidative stress. In vitro and in vivo studies demonstrate selective tumor activation, enhanced ROS generation, effective tumor ablation, and robust antitumor immune responses, including dendritic cell maturation and macrophage repolarization. This work presents a versatile and translationally promising strategy for activatable nano-photosensitizers in precision cancer immunotherapy.

Mn(Pc)/DMAP-catalyzed aerobic oxidation of α -hydrazonoesters into α -diazooesters

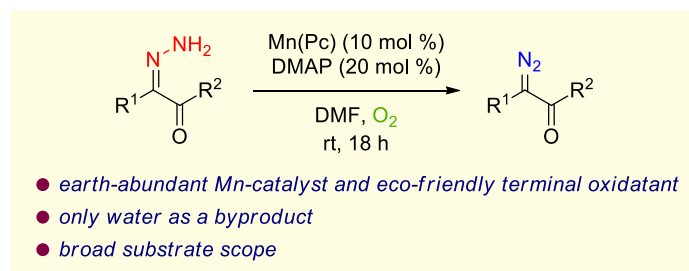
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α -Diazo carbonyl compounds are versatile intermediates in organic synthesis because they serve as precursors to carbenes, metal carbenoids, and 1,3-dipoles. Conventional methods for the synthesis of diazo compounds often require hazardous reagents or stoichiometric oxidants, limiting their environmental sustainability. Although molecular oxygen is an ideal terminal oxidant from the viewpoint of green chemistry, aerobic oxidation of hydrazones to diazo compounds remains relatively underexplored.

Herein, we report a Mn(Pc)/DMAP-catalyzed aerobic oxidation of α -hydrazonoesters into α -diazooesters under mild conditions using molecular oxygen as the terminal oxidant. The developed Mn-catalyzed aerobic oxidation exhibited a broad substrate scope and good functional group tolerance, affording various α -diazooesters in good to excellent yields. Notably, oxidation of substrates containing oxidation-sensitive functionalities proceeded smoothly under the developed conditions. In addition, gram-scale aerobic oxidation was successfully achieved without significant loss of reactivity, demonstrating the practicality of the developed protocol. Preliminary mechanistic studies suggest the involvement of Mn-mediated hydrogen atom transfer processes.



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포스터 발표

Lewis Acid-Enabled Reactivity of Linear N-Silyl Enamines

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Linear N-silyl enamines are versatile intermediates for Lewis acid-mediated bond-forming reactions and provide efficient access to structurally diverse nitrogen-containing molecules. In this study, aza-Mukaiyama aldol-alkylation reactions of linear N-silyl enamines with aldehydes were investigated using trialkylaluminum reagents, which function as both Lewis acids and alkylating agents. In parallel, the reactivity of linear N-silyl enamines toward hypervalent iodine-mediated transformations is being explored through trifluoromethylative functionalization using Togni reagents in the presence of Lewis acids and hydride sources. These results demonstrate the diverse reactivity of linear N-silyl enamines under Lewis acidic conditions.

2026년 유기분과 하계워크숍 Poster presentation

발표제목: Self-Association-Enabled Homo-EDA Activation for Visible-Light Aerobic Dehydrogenation of N-Heterocycles

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Abstract: Although visible-light-driven organic transformations via charge-transfer (CT) activation are well-established, they traditionally rely on hetero-EDA or intramolecular assemblies. Here, we report a catalyst-free activation strategy based on identical molecules, termed "homo-EDA." Under this framework, identical N -heterocycles undergo concentration-dependent intermolecular interactions to generate photoinduced single-electron reactivity under visible light. Using 6-methyl-1,2,3,4-tetrahydroquinoline (6-MeTHQ) as a model substrate, visible-light excitation accesses CT-enriched excited states with transient radical ion character, successfully initiating aerobic dehydrogenation. This transformation proceeds efficiently without additional catalysts or additives. Notably, the method exhibits broad substrate scope and operates successfully across various conditions, including batch, continuous-flow setups, and natural sunlight. The proposed homo-EDA mechanism and the photoinduced single-electron pathway are strongly supported by spectroscopic data and quantum chemical calculations. This work demonstrates that identical molecules can cooperatively participate in intermolecular electronic interactions to enable sustainable organic synthesis.

AI based E3 Ligase Ligand Discovery for Muscle Specific Protein Degradation

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Targeted protein degradation (TPD) has emerged as an innovative therapeutic strategy for eliminating disease-associated proteins that are often undruggable by traditional small-molecule inhibitors. Among various TPD approaches, proteolysis-targeting chimeras (PROTACs) utilize heterobifunctional molecules to recruit E3 ubiquitin ligases to target proteins, leading to their ubiquitination and subsequent proteasomal degradation. However, conventional PROTACs are limited by the narrow availability of E3 ligases, lack of tissue specificity.

To address the lack of tissue specificity, we identified novel ligands for KLHL41, a muscle-specific E3 ligase, through virtual screening and followed by validation using Cellular Thermal Shift Assay (CETSA). Building on these ligands, we developed KLHL41-based PROTACs capable of selectively degrading target proteins in muscle cells.

Our findings provide a new framework for expanding the E3 ligase repertoire in PROTAC design, achieving tissue-specific protein degradation, addressing key limitations of current TPD strategies.

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