
9th International Conference on
Multicomponent Reactions
and Related Chemistry
MCR2026
GUANGZHOU, CHINA • JANUARY 13–16, 2026
A + B + C → A-B-C

Welcome

On behalf of the Local Organizing Committee, we are delighted to welcome you to the **9th International Conference on Multicomponent Reactions and Related Chemistry (MCR2026)**, held in **Guangzhou, China, from January 13 to 16, 2026**.

MCR2026 brings together **approximately 100 participants**, including **45 distinguished speakers from 11 countries**, reflecting the truly international and collaborative nature of the multicomponent reactions community. In close collaboration with the Scientific Advisory Board, the Organizing Committee has prepared a rich and stimulating scientific program that highlights current frontiers in multicomponent reactions, catalysis, and their applications in drug discovery and related fields. Particular emphasis is placed on the active participation, visibility, and development of young scientists.

We would like to express our sincere appreciation to senior researchers for their continued generosity, mentorship, and support, which play a vital role in fostering the next generation of scientists and advancing the field as a whole.

The conference is hosted at **Sun Yat-sen University**, one of China's leading research institutions, offering an inspiring academic setting that combines a strong scientific tradition with a dynamic and modern research environment in the vibrant city of Guangzhou.

We warmly invite you to share your exciting research, engage in in-depth scientific discussions, and enjoy the culture and hospitality of Guangzhou. We are confident that MCR2026 provides both an intellectually rewarding and personally enjoyable experience.

We wish you a productive and memorable conference and are very pleased to welcome you to MCR2026.

With best regards,

Prof. Albert Chan Sun-Chi
Prof. Wenhao Hu
Co-Chairs of the Local Organizing Committee
MCR2026

Committee

International Advisory Board


Erik Van der Eycken, The University of Leuven, Belgium


Albert Chan Sun-Chi, Sun Yat-sen University, China


Wenhao Hu, Sun Yat-sen University, China

Organizing Committee

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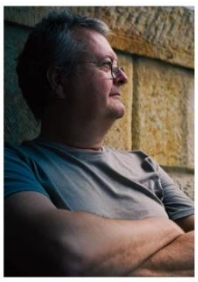
Wenhao Hu, Sun Yat-sen University, China
Wenjing Zhao, Sun Yat-sen University, China
Taoda Shi, Sun Yat-sen University, China
Yijia Yuan, Sun Yat-sen University, China
Dongying Xu, Sun Yat-sen University, China
Huanqian Mo, Sun Yat-sen University, China
Fang Yang, Sun Yat-sen University, China
Yunlin Liu, Guangzhou University, China
Shikun Jia, Zhengzhou University, China
Cheng Zhang, Guangzhou Medical University, China
Xiang Fu, Sun Yat-sen University, China
Feng Xiong, Sun Yat-sen University, China

Programme

Yifeng Chen
East China University of Science and Technology, Shanghai, PR China

Lingling Chu
Donghua University, PR China

Jia-Rong Chen
Central China Normal University, PR China



Alexander Dömling
Czech Advanced Technology and Research Institute, Palacký University Olomouc, Czech Republic

Xiu-Qin Dong
College of Chemistry and Molecular Sciences, Wuhan University, PR China

Ouldouz Ghashghaei
University of Barcelona, Spain

Hanmin Huang
University of Science and Technology of China, PR China

Rongrong Hu
South China University of Technology, PR China

Zhenghui Kang
Shanghai Institute of Materia Medica/Zhongshan Institute for Drug Discovery, CAS

Rodolfo Lavilla
University of Barcelona, Spain

Aiwen Lei
College of Chemistry and Molecular Science, Wuhan University, Wuhan, PR China

Junlong Li
College of Pharmacy, Chengdu University, PR China

Zhong Lian
Sichuan University, Chengdu, PR China

Xiaohua Liu
Sichuan University, PR China

Xinyuan Liu
Southern University of Science and Technology, PR China

Keiji Maruoka
Kyoto University, Japan and Guangdong University of Technology, PR China

The 9th International Conference on Multicomponent Reactions and Related Chemistry 13-16th Jan 2026

Thomas J. J. Müller
Heinrich Heine University Düsseldorf, Germany

Romano V. A. Orru
Vrije Universiteit Amsterdam, The Netherlands

Shiliang Shi
Shanghai Institute of Organic Chemistry, PR China

Wei Shu
Southern University of Science and Technology, Shenzhen, Guangdong, PR China

Leonid G. Voskressensky
Patrice Lumumba Peoples' Friendship University of Russia (RUDN University), Moscow, Russia

Xiaoming Wang
Shanghai Institute of Organic Chemistry， Shanghai, PR China

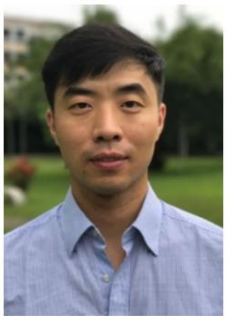
Ludger Wessjohann
Leibniz Institute of Plant Biochemistry (IPB), Germany

Hua Wu
Shanghai Jiao Tong University, Shanghai, PR China

Wanqing Wu
South China University of Technology, Guangzhou, PR China

Xuesong Wu
Huazhong University of Science and Technology, Wuhan, PR China

Zhenghu Xu
Shandong University, Jinan, PR China



Junfeng Yang
Department of Chemistry, Fudan University, PR China

Guoyin Yin
Wuhan University, Wuhan, Hubei, PR China

Andrei K. Yudin
Department of Chemistry, University of Toronto, Canada

Min Zhang
South China University of Technology, Guangzhou, PR China

Wei Zhang
University of Massachusetts Boston, USA

Xingang Zhang
University of Chinese Academy of Sciences, Chinese Academy of Sciences, Shanghai, PR China

Guangfan Zheng
Northeast Normal University, Changchun, PR China

Shifa Zhu
South China University of Technology, Guangzhou, PR China

Campus Map

Conference Agenda

Lecture Location: Sun Yat-sen University, **Lingnan MBA Center MBA402**		
2026-01-12（Mon） 14：00-21：30 Registration Location：Sun Yat-sen University, Sun Yat-sen Kaifeng Hotel		
2026-01-13（Tue）Morning		
Time	**Event**	**Host**
8:00-8:05 8:05-8:10 8:10-8:15 8:15-8:20	Opening ceremony- Welcome from IAB Committee-**Erik Van der Eycken**, The Launch speech-**Albert Chan Sun-Chi**	**Xiaofeng Xiong**
8:20-8:30	Conference Photo Session	
8:30-9:10	PS—**Alexander Dömling** (CATRI, PUO, Czech Republic): *Automation + Miniaturization = Acceleration*	**Aiwen Lei**
9:10-9:35	KS—**Xin-Yuan Liu** (SUST, China): *Cu/Chiral Anionic Ligand-Catalyzed Enantioselective Cross-Couplings*	
9:35-10:00	KS—**Hanmin Huang** (USTC, China): *Aminoalkyl Cyclopalladated Complex: Discovery and Applications*	
10:00-10:25	KS—**Xingang Zhang** (SIOC, CAS, China): *Metal Difluorocarbene Catalytic Couplings*	
10:25-11:05 Coffee Break & Poster Session		
11:05-11:30	KS—**Hua Wu** (SJTU, China): *Rearrangement Reactions-Driven N-Heterocycle Synthesis and Modification*	**Xiaodan Zhao**
11:30-11:55	KS—**Xiaoming Wang** (SIOC, CAS, China): *Biphosphine LigandEnabled Dirhodium-Catalyzed Carbene Difunctionalization*	
11:55-12:20	KS—**Jia-Rong Chen** (CCNU, China): *Photoredox and Copper-Catalyzed Controlled Generation of Radical Anions and Multicomponent Radical Reaction Design*	
12:20-14:00 Lunch break		
2026-01-13（Tue）Afternoon		
14:00-14:40	PS—**Keiji Maruoka** (Kyoto Univ., Japan): *Development of New Photoinduced Multi-Component Radical Relay Reactions*	**Alexander Dömling**
14:40–15:05	KS—**Rongrong Hu** (SCU, China): *Elemental Chalcogen-Based Multicomponent Polymerizations*	
15:05–15:30	KS—**Ouldouz Ghashghaei** (UB, Spain): *Reaction Space Charting of Multicomponent Processes*	
15:30-16:10 Coffee Break & Poster Session		
16:10–16:35	KS—**Xiuqin Dong** (WHU, China): *Efficient Construction of Chiral Molecules via Cooperative Catalysis*	**Shanshui Meng**
16:35–17:00	KS—**Min Zhang** (SCU, China): *Catalytic Reduction-Specified Tandem Reaction*	
17:00-17:05	Sponsor Talk —**Guoyin Lai** (Guangzhou Flower Flavours & Fragrances Co.，Ltd, China)	
17:05-17:15-	OP—**Maxim A. Mironov** (UFU, Russia) *Multicomponent Reactions with Biopolymers as a Powerful Tool for Preparation of 3-D Microstructures*	
17:15-17:25	OP—**Dong Xing** (ECNU, China): *Asymmetric Three-Component Difunctionalization of Alkenes via Radical Relay*	

17:25-17:35	OP—**Zhongqiu Xing** (NJU, China): *Synergistic Photobiocatalysis for Enantioselective Triple Radical Sorting*	
17:35-17:45	OP—**Shenghan Teng** (FJU, China): *Modular Synthesis of Luminescent Boron-Containing Heterocycles From B-Alkynones Trifluoroborates, Amines and Arynes*	
18:00-19:30 Dinner		
2026-01-14（Wed）Morning		
8:00-8:40	PS—**Aiwen Lei** (WHU, China): *Alternating Current (AC) Electrolysis toward Organic Syntheses*	**Keiji Maruoka**
8:40-9:05	KS—**Lingling Chu** (DHU, China): *Asymmetric Multicomponent Radical Cross-Couplings*	
9:05-9:30	KS—**Wei Shu** (SUST, China): *Catalytic Asymmetric Cross-Hydrodimerization of Hydrocarbons*	
9:30-9:55	KS—**Yifeng Chen** (ECUST, China): *Asymemtric Radical Addition Chemistry*	
09:55-10:35 Coffee Break & Poster Session		
10:35-11:00	KS—**Junfeng Yang** (FDU, China): *Pd-Catalyzed Asymmetric Three-Component Coupling of N-Sulfonylhydrazones*	**Liangbin Huang**
11:00-11:25	KS—**Guangfan Zheng** (NENU, China): *Multicomponent Radical Reactions Leveraging the Persistent Radical Effect*	
11:25-11:50	KS—**Wanqing Wu** (SCUT, China): *Heteroatom-Promoted Sequential Conversions of Unsaturated Hydrocarbons*	
11:50-14:00 Lunch break		
2026-01-14（Wed）Afternoon		
14:00-14:40	PS—**Andrei K. Yudin** (UofT, Canada): *Isoreactivity in Chemistry*	**Rodolfo Lavilla**
14:40-15:05	KS—**Romano V. A. Orru** (VU Amsterdam, Netherlands): *Isocyanides: Chemical Chameleons*	
15:05-15:30	KS—**Zhong Lian** (SCU, China): *Mechanical Synthetic Chemistry*	
15:30-15:55	KS—**Junlong Li** (CDU, China): *Remote Site-selective Arene C–H Functionalization Enabled by N-Heterocyclic Carbene Organocatalysis*	
15:55-16:35 Coffee Break & Poster Session		
16:35-17:00	KS—**Xiaohua Liu** (SCU, China): *Asymmetric Multicomponent Reaction Catalyzed by Chiral Metal Complexes*	**Jun Wang**
17:00-17:25	KS—**Zhenghu Xu** (SDU, China): *Tandem Metal Relay Catalysis to polycycles*	
17:25-17:30	Sponsor Talk —**Yiming Li** 3S-TECH	
17:30-17:40	OP—**Yu Qian** (SYSU, China): *Multicomponent Reactions with Rh Carbynoids*	
17:40-17:50	OP—**Georg Manolikakes** (RPTU, Germany): *Modular Synthesis of Sulfonamides and Sulfonates via Electrochemical Fixation of Sulfur Dioxide*	
17:50-18:00	OP—**A. S. Golubenkova** (RU., Russia): *A Domino Route From Imidazolines and Electron-Deficientalkynes to Polysubstituted Pyrroles, Tetrahydropyrrolo[1,2-A]Pyrazines and Pyridines*	
2026-01-15（Thur）Morning		

8:40-9:05	KS—**Guoyin Yin** (SCUT, China): *Nicekel Chain-Walking Catalysis for Multicomponent Alkene Functionalization*	**Andrei K. Yudin**
9:05-9:30	KS — **Wei Zhang** (UMB, USA): *Integrated One-Pot Stepwise Synthesis and Organocatalysis*	
9:30-9:55	KS—**Leonid G. Voskressensky** (RU, Russia): *Electron-Deficient Alkynes – Universal Synthons for Producing Condensed Aza-Heterocyclic Systems*	**Andrei K. Yudin**
10:35-11:00	KS—**Rodolfo Lavilla** (UB, Spain): *Heterocyclic Multicomponent Reactions. New Reactivity Trends and Biomed Applications (25 Years of MCR Research in Barcelona)*	**Honggen Wang**
09:55-10:35	Coffee Break & Poster Session	
11:00-11:25	KS—**Shiliang Shi** (SIOC, CAS, China): *Asymmetric NHC–Metal Catalysis*	**Honggen Wang**
11:25-11:50	KS—**Xuesong Wu** (HUST, China): *Light-Driven Multicomponent Radical Reactions with Sulfur-Containing Small Molecules*	
11:50-14:00	Lunch break	
14:00-14:40	KS—**Shifa Zhu** (ZSTU, China): *Catalytic Transformation of Acetylene*	**Cheng Wang**
14:40-15:05	KS—**Ludger Wessjohann** (LIPB, Germany): *Tumor-targeting with MCR-derived drugs and conjugates*	
15:05-15:30	KS—**Thomas J. J. Müller** (HHU Düsseldorf, Germany): *Sequentially Pd-Catalyzed Processes–Consecutive Multicomponent Synthesis of Functional Molecules in Catalyst Economic Fashion*	
15:30-15:55	KS—**Zhenghui Kang** (SIMM, CAS, China): *Multicomponent Reactions Enabled by Metal Carbene Multifunctionalization*	
15:55-16:35	Coffee Break & Poster Session	
16:35-16:45	OP—**Minghui Wu** (AMIBM, Netherlands): *Non-Innocent Behaviour of Aromatic Isocyanides Under Visible Light: A Pathway to Thioformimidates and Dehydroalanine*	**Zhongqiu Xing**
16:45-16:55	OP—**M. I. D. Mardjan** (UGM, Indonesia): *Straightforward Access to Bioactive Quinazolinones Through One-Pot Reaction*	
16:55-17:05	**OP—Chunan Wang (SYSU, China):** *Chemo-, Regio- and Stereoselective Modification of Sugars via a Multicomponent Reaction*	
17:05-17:10	Sponsor Talk —**Paul Wei**, (FLM, China)	**Taoda Shi**
17:10-17:15	Sponsor Talk —**Taoda Shi**, **(**MD, China**)**	
17:15-17:30	Speaker & Poster Awards	
17:30-17:40	Closing ceremony- **Alexander Dömling, Rodolfo Lavilla, Wenhao Hu**	

Cultural Excursion Program

2026-01-16（Friday）

09:20: Meet at the lobby of **Xue Ren Guan** (Scholars' Lodge) and depart

09:30–10:50: Visit to the **South Campus Museum**

11:00–12:00: Visit to the **University History Museum**

12:00: Lunch at **Xue Ren Guan** (Scholars' Lodge)

13:00: Meet at the lobby of **Xue Ren Guan** and depart

13:45–14:45: Visit to the **Chen Clan Ancestral Hall** (Chenjiaci)

15:00–16:30: Visit to **Shamian Island**

16:30: Return

18:00: Dinner at **Xue Ren Guan** (Scholars' Lodge)

19:00: **Pearl River Night Cruise**

Awards

To encourage academic exchange and recognize outstanding scientific contributions, the conference will present awards for **Oral and Poster Presentations**.

Conference Awards

- **Best Oral Presentation**
  - 1st Prize: RMB 800
  - 2nd Prize: RMB 600
  - 3rd Prize: RMB 400
- **Best Poster Presentation**
  - 1st Prize: RMB 800
  - 2nd Prize: RMB 600
  - 3rd Prize: RMB 400

Sponsored Awards

In addition, *Molecular Diversity* will sponsor two special awards by providing **book vouchers** for:

- **Best Student Oral Presentation**
- **Best Student Poster Presentation**

Awardees will be selected by the conference evaluation committee based on scientific quality, originality, and presentation performance.

Communication Index

PLENARY SPEAKERS

PS-1. **Alexander Dömling.** *Palacky University,* Czech Republic

AUTOMATION + MINIATURIZATION = ACCELERATION

PS-2. **Aiwen Lei.** *Wuhan University*. China

ALTERNATING CURRENT (AC) ELECTROLYSIS TOWARD ORGANIC SYNTHESES

PS-3. **Keiji Maruoka.** *Kyoto University*. Japan

DEVELOPMENT OF NEW PHOTOINDUCED MULTI-COMPONENT RADICAL RELAY REACTIONS

PS-4. **Andrei Yudin.** *University of Toronto*. Canada

ISOREACTIVITY IN CHEMISTRY

KEYNOTE SPEAKERS

KS-1. **Yifeng Chen.** *East China University of Science and Technology*. China

ASYMEMTRIC RADICAL ADDITION CHEMISTRY

KS-2. **Lingling Chu.** *Donghua University*. China

ASYMMETRIC MULTICOMPONENT RADICAL CROSS-COUPLINGS

KS-3. **Jia-Rong Chen.** *Central China Normal University*. China

PHOTOREDOX AND COPPER-CATALYZED CONTROLLED GENERATION OF RADICAL ANIONS AND MULTICOMPONENT RADICAL REACTION DESIGN

KS-4. **Xiu-Qin Dong.** *Wuhan University*. China

EFFICIENT CONSTRUCTION OF CHIRAL MOLECULES VIA COOPERATIVE CATALYSIS

KS-5. **Ouldouz Ghashghaei.** *University of Barcelona*. Spain

REACTION SPACE CHARTING OF MULTICOMPONENT PROCESSES

KS-6. **Hanmin Huang.** *University of Science and Technology of China*. China

AMINOALKYL CYCLOPALLADATED COMPLEX: DISCOVERY AND SYNTHETIC APPLICATIONS

KS-7. **Rongrong Hu.***South China University of Technology.*China

ELEMENTAL CHALCOGEN-BASED MULTICOMPONENT POLYMERIZATIONS

KS-8. **Zhenghui Kang.***Shanghai Institute of Materia Medica.*China

Multicomponent Reactions Enabled by Metal Carbene Multifunctionalization

KS-9. **Rodolfo Lavilla.** *University of Barcelona*. Spain

HETEROCYCLIC MULTICOMPONENT REACTIONS. NEW REACTIVITY TRENDS AND BIOMED APPLICATIONS

KS-10. **Jun-Long Li.** *Chengdu University*. China

REMOTE SITE-SELECTIVE ARENE C-H FUNCTIONALIZATION ENABLED BY N-HETEROCYCLIC CARBENE ORGANOCATALYSIS

KS-11. **Zhong Lian.** *Sichuan University*. China

MECHANICAL SYNTHETIC CHEMISTRY

KS-12. **Xiaohua Liu.** *Sichuan University*. China

ASYMMETRIC MULTICOMPONENT REACTION CATALYZED BY CHIRAL METAL COMPLEXES

KS-13. **Xin-Yuan Liu.** *Southern University of Science and Technology*. China

Cu/CHIRAL ANIONIC LIGAND-CATALYZED ENANTIOSELECTIVE CROSS-COUPLINGS

KS-14. **Thomas J. J. Müller.** *Heinrich Heine University Düsseldorf*. Germany

SEQUENTIALLY PD-CATALYZED PROCESSES-CONSECUTIVE MULTICOMPONENT SYNTHESIS OF FUNCTIONAL MOLECULES IN CATALYST ECONOMIC FASHION

KS-15. **Romano V.A. Orru.** *Maastricht University*. Netherlands

ISOCYANIDES: CHEMICAL CHAMELEONS

KS-16. **Shi-Liang Shi.** *Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences*. China

ASYMMETRIC NHC-METAL CATALYSIS

KS-17. **Wei Shu.** *Southern University of Science and Technology*. China

CATALYTIC ASYMMETRIC CROSS-HYDRODIMERIZATION OF HYDROCARBONS

KS-18. **Voskressensky L.G.** *Peoples'Friendship University of Russia*. Russia

ELECTRON-DEFICIENT ALKYNES-UNIVERSAL SYNTHONS FOR PRODUCING CONDENSED AZA-HETEROCYCLIC SYSTEMS

KS-19. **Xiaoming Wang.** *Shanghai institute of Organic Chemistry,Chinese Academy of Sciences*. China

BIPHOSPHINE LIGAND ENABLED DIRHODIUM-CATALYZED CARBENE DIFUNCTIONALIZATION

KS-20. **Ludger A. Wessjohann & team.** *Leibniz Institute of Plant Biochemistry*. Germany

TUMOR-TARGETING WITH MCR-DERIVED DRUGS AND CONJUGATES

KS-21. **Hua Wu.** *Shanghai Jiao Tong University*. China

REARRANGEMENT REACTIONS-DRIVEN N-HETEROCYCLE SYNTHESIS AND MODIFICATION

KS-22. **Wanqing Wu.** *South China University of Technology*. China

HETEROATOM-PROMOTED SEQUENTIAL CONVERSIONS OF UNSATURATED HYDROCARBONS

KS-23. **Xuesong Wu.** *Huazhong University of Science and Technology*. China

LIGHT-DRIVEN MULTICOMPONENT RADICAL REACTIONS WITH SULFUR-CONTAINING SMALL MOLECULES

KS-24. **Zhenghu Xu.** *Shandong University*. China

ASYMMETRIC METAL RELAY CATALYSIS TO PLANAR CHIRAL [2.2]PARACYCLOPHANES

KS-25. **Junfeng Yang.** *Fudan University*. China

PD-CATALYZED ASYMMETRIC THREE-COMPONENT COUPLING OF N-SULFONYLHYDRAZONES

KS-26. **Guoyin Yin.** *South China University of Technology*. China

NICEKEL CHAIN-WALKING CATALYSIS FOR MULTICOMPONENT ALKENE FUNCTIONALIZATION

KS-27. **Min Zhang.** *Sichuan University*. China

CATALYTIC REDUCTION-SPECIFIED TANDEM REACTIONS

KS-28. **Wei Zhang.** *University of Massachusetts Boston*. USA

INTEGRATED ONE-POT STEPWISE SYNTHESIS AND ORGANOCATALYSIS

KS-29. **Xingang Zhang.** *Chinese Academy of Sciences*. China

METAL DIFLUOROCARBENE-INVOLVED CATALYTIC COUPLING

KS-30. **Guangfan Zheng.** *Northeast Normal University*. China

MULTICOMPONENT RADICAL REACTIONS LEVERAGING THE PERSISTENT RADICAL EFFECT

KS-31. **Shifa Zhu.** *Zhejiang Sci-Tech University*. China

CATALYTIC TRANSFORMATION OF ACETYLENE

ORAL PRESENTATIONS

OP-1. **Georg Manolikakes.** *RPTU Kaiserslautern-Landau*. Germany

MODULAR SYNTHESIS OF SULFONAMIDES AND SULFONATES VIA ELECTROCHEMICAL FIXATION OF SULFUR DIOXIDE

OP-2. **Muhammad Idham Darussalam Mardjan.** *Universitas Gadjah Mada*. Indonesia

STRAIGHTFORWARD ACCESS TO BIOACTIVE QUINAZOLINONES THROUGH ONE-POT REACTION

OP-3. **Maxim A. Mironov.** *Ural Federal University*. Russia

MULTICOMPONENT REACTIONS WITH BIOPOLYMERS AS A POWERFUL TOOL FOR PREPARATION OF 3-D MICROSTRUCTURES

OP-4. **Yu Qian.** *Sun Yat-sen University*. China

MULTICOMPONENT REACTIONS WITH Rh CARBYNOIDS

OP-5. **Golubenkova A.S.** *Peoples'Friendship University of Russia*. Russia

A DOMINO ROUTE FROM IMIDAZOLINES AND ELECTRON-DEFICIENTALKYNES TO POLYSUBSTITUTED PYRROLES, TETRAHYDROPYRROLO[1,2-A]PYRAZINES AND PYRIDINES

OP-6. **Shenghan Teng.** *Fujian Normal University*. China

MODULAR SYNTHESIS OF LUMINESCENT BORON-CONTAINING HETEROCYCLES FROM B-ALKYNONES TRIFLUOROBORATES, AMINES AND ARYNES

OP-7.**Chunan Wang.** *Sun Yat-sen University.* China

CHEMO-, REGIO- AND STEREOSELECTIVE MODIFICATION OF SUGARS VIA A MULTICOMPONENT REACTION

OP-8. **Minghui Wu.** *Maastricht University*. Netherlands

NON-INNOCENT BEHAVIOUR OF AROMATIC ISOCYANIDES UNDER VISIBLE LIGHT: A PATHWAY TO THIOFORMIMIDATES AND DEHYDROALANINE

OP-9. **Dong Xing.** *East China Normal University.* China

ASYMETRIC THREE-COMPONENT DIFUNCTIONALIZATION OF ALKENES VIA RADICAL RELAY

OP-10. **Zhongqiu Xing.** *Nanjing University*. China

SYNERGISTIC PHOTOBIOCATALYSIS FOR ENANTIOSELECTIVE TRIPLE RADICAL SORTING

PLENARY SPEAKERS

Name：Alexander Dömling

Affiliation: Palacky University

Address: Innovative Chemistry Group

Email: A.S.S.Domling@rug.nl

Short biograph:

Prof. Alexander Dömling is ERA Chair of the Innovative Chemistry Group at Palacký University Olomouc, where his research focuses on the design and discovery of bioactive compounds for difficult drug targets such as protein–protein interactions, transcription factors, and RNA. He received his PhD under Ivar Ugi at the Technical University of Munich and carried out postdoctoral studies with Nobel laureate Barry Sharpless at The Scripps Research Institute. At the University of Pittsburgh, where he became Full Professor, he co-developed the widely used web-based discovery tool **ANCHOR.QUERY**. From 2011 to 2022 he was Chair of Drug Design at the University of Groningen. He now leads the ERC Advanced Grant–funded **AMADEUS** platform, which introduces a novel paradigm for preclinical drug discovery by integrating nanoliter dispensing, high-throughput chemistry, purification, screening, and machine learning. With over 300 publications and more than 70 patents, he is also a serial entrepreneur translating innovation “from bench to bedside.”

Automation + Miniaturization = Acceleration

"Boring is good," some say, reflecting the steady reliability of traditional engineering, while "Data is the new oil" has become the mantra of modern innovation. Chemistry, long viewed as a conservative discipline, now stands at a transformative crossroads shaped by disruptive technologies. Artificial intelligence—through large language models (LLMs) and related tools—rapidly processes complex challenges, reshaping how we approach intellectual property, knowledge discovery, and molecular design. In parallel, highly miniaturized and automated synthesis platforms are redefining how molecules are created and optimized. In the Dömling laboratory, supported by the ERC Advanced Grant AMADEUS and the ERA Chair ACCELERATOR, we embrace the principle: Automation + Miniaturization = Acceleration. In 2019, we introduced acoustic droplet ejection (ADE) technology for small-molecule synthesis, enabling execution of thousands of reactions per day at nanoliter scale (ACS Cent. Sci. 2019, 5, 451-457). ADE combines unparalleled precision with high speed—2.5 nL droplets at up to 400 Hz into 1536-well plates—validated across dozens of transformations. Coupled with rapid MS analytics and miniaturized purification, this provides immediate feedback and compound availability. By integrating generative neural networks and property-driven selection, ADE generates "big data" for machine learning, advancing reactivity prediction and molecular optimization. Furthermore, coupling ADE with protein mass spectrometry accelerates discovery of covalent inhibitors against disease-relevant targets at unprecedented throughput. A new era is emerging in chemistry—defined by robust automation, data-rich experimentation, and the synergy of AI with miniaturized synthesis—redefining the discovery process itself.

Name：Aiwen Lei

Affiliation: Wuhan University

Address: No. 299, Bayi Road, Wuchang District, Wuhan City, Hubei Province

Email: aiwenlei@whu.edu.cn

Short biograph:

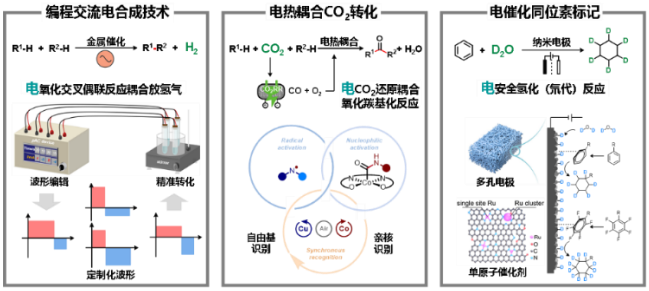
Lei Aiwen, a Second-Class Professor at Wuhan University, Vice Dean of the Advanced Institute of Wuhan University, and Associate Editor of the internationally authoritative journal Green Chemistry. He has received the 4th Yoshida Prize (2019), was named a Leading Talent in Scientific and Technological Innovation under the National "Ten Thousand Talents Program" (2017), a Chang Jiang Scholar Distinguished Professor (2014), a recipient of the National Science Fund for Distinguished Young Scholars (2010), the First Prize of the Outstanding Scientific Research Achievements (Science and Technology) of Institutions of Higher Education of the Ministry of Education (2017, first completer), and the First Prize of Natural Science of Hubei Province (2012, first completer). He serves as the Deputy Director of the Homogeneous Catalysis Professional Committee of the Catalysis Committee of the Chinese Chemical Society, a Member of the Organic Chemistry Disciplinary Committee of the Chinese Chemical Society, and a Member of the Physical Organic Chemistry Professional Committee of the Chinese Chemical Society.

Alternating Current (AC) Electrolysis toward Organic Syntheses

Aiwen Lei

Keywords: *AC electrolysis, organic synthesis, metal-catalyzed electrolysis, reaction intermediates*

Electricity, as an important form of energy, has contributed to the rapid development of modern industry. The microscopic core of the precise control of electricity is the level of precise manipulation of electrons, which has been widely used in many fields and industries, such as electronic devices and intelligent control, mapping the progress of society, but the application in the synthesis of substances is still in the initial stage. Our team reports a programmable waveform alternating current (AC) synthesis technology that realizes two types of anodic oxidation-coupled cathodic hydrogen discharge reactions. By adjusting the parameters of frequency, current and duty cycle of the alternating current, customized current waveforms are generated, thus achieving precise control of transition metal catalytic species and breaking the dependence of traditional DC catalysis on diaphragm electrolytic cells. This study provides a new opportunity to introduce electronic precision control technology into the field of electrosynthesis. In addition, the team also reported the coupled oxidative carbonylation reaction mode of electroreduced carbon dioxide, in which CO, which is commonly used in industry, was replaced with inert and non-toxic carbon dioxide, and then asymmetric ureas, which are important for pharmaceutical and pesticide applications, were synthesized with high efficiency. In the study of nano-metal cathode-catalyzed reduction of deuterium substitution reaction, the team successfully synthesized high-value deuterium drugs, which are difficult to be achieved by traditional methods, by using cheap and easy-to-obtain deuterium water as deuterium source through the electrocatalytic strategy. The research results demonstrate the great potential of synthetic electrochemistry in drug development and practical applications.



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Name：Keiji Maruoka

Affiliation: Kyoto University

Address: Graduate School of Pharmaceutical Sciences, Kyoto University, Kyoto 606-8501, Japan

Email: maruoka.keiji.4w@kyoto-u.ac.jp

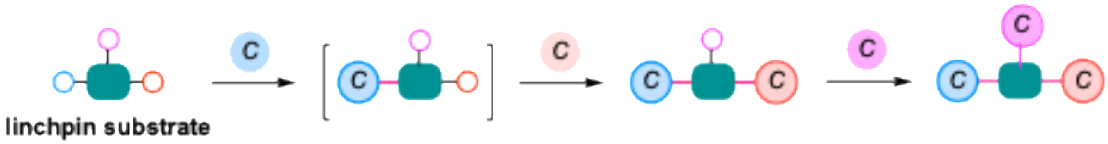
Short biograph:

Keiji Maruoka was born in Japan. He graduated from Kyoto University (1976) and received his Ph.D. (1980) from University of Hawaii (Thesis Director: Prof. H. Yamamoto). He became an assistant professor of Nagoya University (1980) and promoted to a lecturer (1985) and an associate professor (1990) there. He moved to Hokkaido University as a full professor (1995-2001), and then was a professor in the Graduate School of Science in Kyoto University (2000-2019). After formal retirement, he is now a specially-appointed professor in Kyoto University since 2019. He is also a chair professor of Guangdong University of Technology, China as a second-term Chang-Jiang Scholar. Recently, he was awarded the Chemical Society of Japan Award (2007), the Molecular Chirality Award (2007), Novartis Lectureship Award (2007/2008), Chunichi Cultural Prize (2010), Arthur C. Cope Scholar Awards (2011), Medal of Honor with Purple Ribbon (2011), Humboldt Research Award (2011), Torey Science & Technology Award (2012), Noyori Prize (2016), The Japan Academy Prize (2018), Fujiwara Award (2022), and 2023 Ryoji Noyori ACES award. He also serves as the President of the Chemical Society of Japan since 2024.

Development of New Photoinduced Multi-Component Radical Relay Reactions

Abstract

Rapid assembly of readily and widely available substrates into synthetically valuable molecules is of prime importance in modern organic synthesis. The use of small organic molecules that can be connected with multiple substrates by a sequential C−C bond-forming process has offered a multidirectional approach to increase molecular complexity with high modularity. Such multicomponent protocols utilizing linchpin compounds have enabled the expeditious construction of complex building blocks for natural products and biologically active compounds. However, their C−C bond-forming processes rely heavily on the use of organometallic reagents as strong nucleophiles, which narrows the scope of accessible products due to limited functional group compatibility. Moreover, complicated manipulations under cryogenic conditions with the strict prohibition of water are frequently required to control the reactivity of these reagents and intermediates. On the other hand, the chemistry of radical species can provide a complementary approach to that of ionic species for new bond formations. The recent advances in synthetic methodologies for the generation of radical species, such as photoredox catalysis and electrocatalysis, have made these conditions milder and more practical. Despite these breakthroughs, the linchpin coupling strategy based on radical-mediated C−C bond formations has been less explored. In this lecture, I would like to describe a metal-free, radical-mediated coupling approach using formyl- and carbonyl-stabilized phosphonium ylides as multifunctional linchpins under visible-light photoredox conditions. The stepwise and controllable generation of these radical intermediates allows sequential photocatalysis involving two mechanistically distinct radical additions, both of which are initiated by the same photocatalyst in one pot with a high functional-group tolerance.



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Name：Andrei Yudin

Affiliation: University of Toronto

Address: Department of Chemistry, Lash Miller Chemical Laboratories, 80 St. George Street, Toronto, ON M5S 3H6

Email: Andrei.yudin@utoronto.ca

Short biograph:

Andrei Yudin is the Tier I Canada Research Chair in Medicine by Design and Professor of Chemistry at the University of Toronto. He received his undergraduate degree from Moscow State University in 1992 and earned his Ph.D. in 1996 at the University of Southern California under the supervision of G. K. S. Prakash and Nobel Laureate George A. Olah. He then pursued postdoctoral studies with Nobel Laureate K. Barry Sharpless at The Scripps Research Institute before beginning his independent career at the University of Toronto in 1998. He was promoted to Associate Professor in 2002 and to Full Professor in 2007. Professor Yudin's research has pioneered new concepts in chemical reactivity, macrocycle synthesis, and peptide modification, with broad impact on drug discovery and fundamental chemical reactivity. His contributions have been recognized with numerous honors, including the 2025 Liebig Fellowship (University of Giessen, Germany), the 2024 Arthur C. Cope Scholar Award (American Chemical Society), the 2024 IOCF Zen-ichi Yoshida Lectureship (Kyoto University), the 2022 Konrad Adenauer Award from the Humboldt Foundation (Germany), and the 2023 Organic Reactions Lectureship at the University of California–Irvine. In the past 3 years he has also served as a Visiting Professor at Sorbonne University, Hokkaido University, and the Australian National University. He is currently an Associate Editor for *Chemical Science* (Royal Society of Chemistry).

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ISOREACTIVITY IN CHEMISTRY

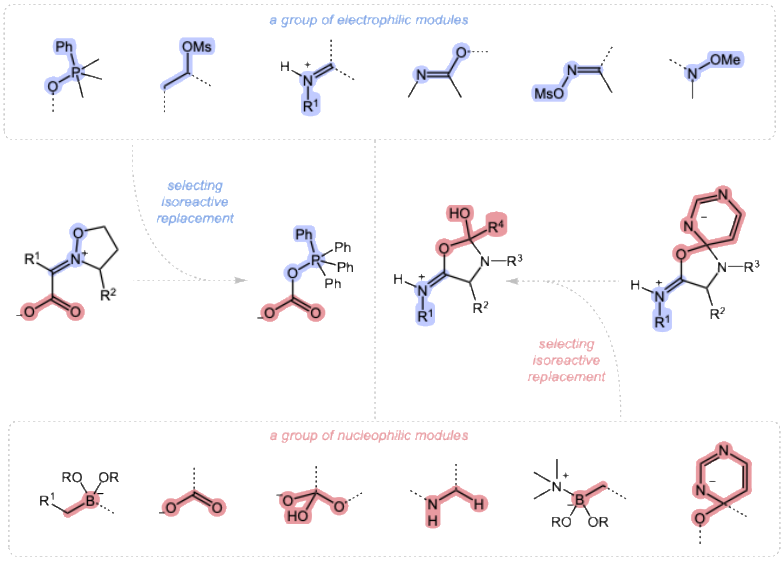
Andrei K. Yudin[a]

[a]*Chemistry Department, University of Toronto*

e-mail: andrei.yudin@utoronto.ca

Keywords: *isoreactivity, synthetic half-reactions, reaction discovery*

The concept of isoreactivity seeks to reveal parallels in chemical behavior by comparing the functional roles of structural modules within reaction mechanisms. This framework enables systematic analysis of diverse transformations through the replacement of structural modules that preserve reaction viability, even when the underlying mechanism diverges. Isoreactive module replacement is expected to modify intrinsic barriers and thermodynamic contributions to activation profiles while maintaining the overall feasibility of the forward reaction pathway. Isoreactive relationships extend traditional isoelectronic and isolobal analogies by addressing cases where comparable reactivity cannot be adequately captured by existing conventions. The language of functional modules highlights mechanistic relationships that elude the peripheral modifications encoded by typical substituent changes. By illuminating the mechanistic roles of deep-seated, structurally distinct subunits that enable viable reaction trajectories, isoreactivity establishes a practical and inclusive vocabulary for describing chemical reactivity in multicomponent reactions.



KEYNOTE SPEAKERS

Name：Yifeng Chen

Affiliation: East China University of Science and Technology

Address: 130 Meilong Road, Shanghai, China

Email: yifengchen@ecust.edu.cn

Short biography：

Dr. Yifeng Chen is a professor in the School of Chemistry and Molecular Engineering at East China University of Science and Technology (ECUST). He received his B.S. degree (2007) in Chemistry at Soochow University, and earned his Ph.D. degree (2012) in Organic Chemistry at Shanghai Institute of Organic Chemistry (SIOC) under the supervision of Prof. Yuanhong Liu. He then performed the post-doctoral research with Prof. Stephen Buchwald at Massachusetts Institute of Technology (MIT) and Prof. Timothy Newhouse at Yale University (Yale) respectively before joining ECUST in 2017. His current research interest focuses on the organic chemistry, particularly on the development of novel synthetic method in asymmetric radical chemistry and C1 chemistry.

Asymemtric Radical Addition Chemistry

Yifeng Chen,[a]

[a]*East China University of Science and Technology*

e-mail: yifengchen@ecust.edu.cn

Keywords: *asymmetric catalysis, radical chemsitry, cobalt, carbonyl addition*

The catalytic asymmetric addition of carbonyls with organometallic reagents represents a well-established method for chiral amine and alcohol synthesis. Nevertheless, these approaches are dominated by the use of moisture- and air-sensitive organometallic reagents. Moreover, the most reliable organometallic nucleophiles, including organolithium, Grignard reagent and a small number of dialkylzinc reagents, are less functionality-group tolerable. Herein we report a catalytic asymmetric radical addition protocol with various unactivated alkyl halides, including alkyl iodides, alkyl bromides and alkyl chlorides, enabling the formation of chiral α-amino esters, alcohols, amides and sulfinamide with a high level of enantioselectivity and excellent functional group tolerance.

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Name：Lingling Chu

Affiliation: Donghua University, PR China

Email: lingling.chu1@dhu.edu.cn

Short biography：

Lingling Chu was born in Anhui Province, China. She earned her BSc in Engineering from Hefei University of Technology in 2007 and completed her Ph.D. at the Shanghai Institute of Organic Chemistry (SIOC) in 2012 under the supervision of Professor Feng-Ling Qing, focusing on organofluorine chemistry. From 2012 to 2015, she pursued postdoctoral research with Professor David MacMillan at Princeton University, where she worked on photoredox catalysis.

In 2016, she joined Donghua University as a Professor and established her independent research group. Her research interests lie in the areas of transition metal catalysis and radical chemistry. She has authored over 50 publications as a corresponding author in top-tier journals such as Chemical Society Reviews, Journal of the American Chemical Society, Nature Communications, and Angewandte Chemie International Edition, etc.

Dr. Chu is a recipient of the National High-Level Talent Program and the Excellent Youth Program of the National Natural Science Foundation of China. Her scientific contributions have been recognized with several prestigious awards, including the Second Prize of the National Natural Science Award (second rank), the First Prize of Natural Science of Shanghai Municipality (second rank), the Shanghai Women's Innovation Award, and the Thieme Chemistry Journals Award.

"Asymmetric Multicomponent Radical Cross-Couplings"

Lingling Chu

Donghua University, PR China

email: lingling.chu1@dhu.edu.cn

The development of efficient catalytic multicomponent reactions (MCRs) is highly sought-after in chemical synthesis. Particularly, catalytic radical MCRs represent a powerful technology for rapidly constructing molecular complexity from readily available starting materials with complementary reactivity and selectivity. However, due to the exceptionally high reactivity of open-shell radical species, catalytic asymmetric radical MCRs remain largely under-developed. One of the research interests in the Chu group at Donghua University is developing enantioselective radical MCR reactions via nickel catalysis. This talk will present enantioselective radical three-component difunctionalization reactions of alkenes via nickel catalysis based on chelation and sensitization strategies. Computational and experimental mechanistic studies will be briefly discussed.

Name：Jia-Rong Chen

Affiliation: Central China Normal University

Address: 152 Luoyu Road, Wuhan, Hubei 430079, China

Email: chenjiarong@ccnu.edu.cn

Short biography:

Jia-Rong Chen earned his Ph.D. from CCNU under the supervision of Prof. Wen-Jing Xiao in 2009. From 2011 to 2012, he engaged in postdoctoral research as a Humboldt Fellow with Prof. Carsten Bolm at RWTH Aachen University. In 2012, he returned to CCNU to begin his independent career and was promoted to full professor in 2016. His research interests include photoredox catalysis, asymmetric radical cross-coupling, and multicomponent radical reactions.

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Photoredox and Copper-Catalyzed Controlled Generation of Radical Anions and Multicomponent Radical Reaction Design

Jia-Rong Chen[a,b,*]

[a]*College of Chemistry, Central China Normal University*

[b]*Wuhan Institute of Photochemistry and Technology*

e-mail: chenjiarong@mail.ccnu.edu.cn

Keywords: *multicomponent radical reaction, photoredox catalysis, copper catalysis, radical anions*

Radical anions, which possess both the properties of radicals and anions, are an important type of intermediate in organic synthesis transformations.[1] However, the common methods for generating such reactive intermediates often require relatively harsh conditions, leading to difficulties in controlling the reactivity and limited functional group compatibility. In recent years, with the development of photoredox catalysis and transition metal catalysis,[2] the chemistry of radical anions has ushered in new opportunities. Building on our previous work in photocatalysis and copper catalysis,[3] we have developed a synergistic mode of photoredox and copper catalysis for controllable generation and efficient transformations of radical anions, including asymmetric cynanofunctionalization of alkenes, hydroalkynylation and hydroarylation of alkenes, and hydrofunctionalization of epoxides.[4]

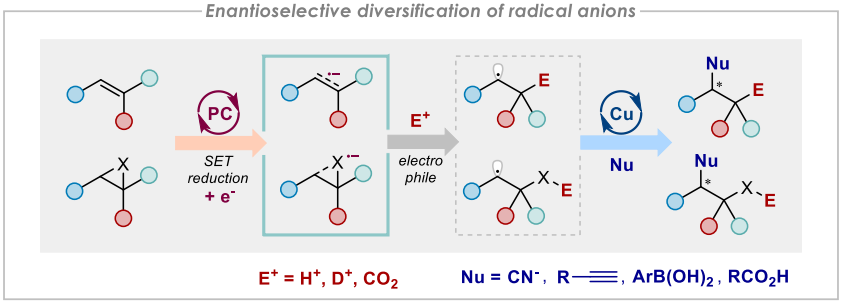

Fig. 1 Enantioselective diversification of radical anions

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Name：Xiu-Qin Dong

Affiliation: Wuhan University

Address: College of Chemistry and Molecular Sciences, Wuhan University

Email: xiuqindong@whu.edu.cn

Short biography:

Xiu-Qin Dong received her PhD degree from Wuhan University in 2012 supervised by Prof. Chun-Jiang Wang. After postdoctoral research at the Hong Kong University of Science and Technology with Prof. Jianwei Sun (2012-2014), she joined the College of Chemistry and Molecular Sciences at Wuhan University as an associate professor in 2015, and was promoted to full professor in 2023. Her research interests mainly focused on the development of chiral ligands, asymmetric hydrogenation, asymmetric catalytic reactions, asymmetric synergistic catalysis. She has published over 100 publications as the corresponding author in top-tier journals such as Acc. Chem. Res., J. Am. Chem. Soc., Angew. Chem. Int. Ed., Nat. Commun., CCS Chem., Fundam. Res., Chem. Sci., ACS Catal., etc. She received the National Young Talents Support Program, Hubei Province Chutian Scholar Program (Chutian Scholar - Rising Star) and Distinguished Youth Fund of Hubei Province.

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Efficient Construction of Chiral Molecules *via* Cooperative Catalysis

Xiu-Qin Dong[a]

[a] *College of Chemistry and Molecular Sciences, Wuhan University*

e-mail: xiuqindong@whu.edu.cn

Keywords: *cooperative catalysis, non-covalent interactions, asymmetric catalytic reactions …*

Based on cooperative catalysis strategy, our research group focuses on the development of novel chiral phosphine ligands and efficient asymmetric catalytic systems for the efficient synthesis of chiral molecules. Our research work mainly focused on the following two aspects: (1) Developing new chiral bisphosphine ligands based on non-covalent ion-pair and hydrogen-bond cooperative catalysis strategies. By introducing non-covalent interactions into the ligands, the interaction between the ligands and reaction substrates is enhanced, which could provide favorable chiral induction environment and improve reaction reactivity. These ligands have been applied to a series of asymmetric hydrogenation reactions, efficiently synthesizing a variety of structurally diverse chiral molecules with excellent reaction results;[1−2] (2) Efficiently constructing multifunctionalized chiral molecules based on a synergistic catalytic system combining organocatalysis and photocatalysis.[3] Additionally, we realized stereodivergent synthesis of structurally important chiral molecules bearing multiple stereocenters using bimetallic synergistic catalytic system.[4] We made an effort to the precise assembly of diverse chiral scaffolds, mechanistic investigations, and applying these methodologies to develop new synthetic routes for important chiral pharmaceuticals and bioactive molecules.

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Name：Ouldouz Ghashghaei

Affiliation: University of Barcelona

Address: Av. de Joan XXIII, 27-31, 08028 Barcelona, Spain

Email: ghashghaei@ub.edu

Short biography:

Ouldouz received her BSc. in Chemistry and her first MSc. Polymer Sciences from Sharif University of Technology (Iran). Moving to Barcelona, she received a second MSc. and her PhD in Experimental and Industrial Organic Chemistry from the University of Barcelona (UB). She was appointed as the adjunct professor of Organic Chemistry and Medicinal Chemistry at the Faculty of Pharmacy (UB) in 2021 and joined IDIBELL as a research collaborator in 2025. Sha has co-authored 25 scientific publications and has participated in various collaborative projects with public and private partners. Her research focuses on developing chemical tools for biomedical research by facilitating synthetic approaches.

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REACTION SPACE CHARTING OF MULTICOMPONENT PROCESSES

Ouldouz Ghashghaei,[a,b,c]

[a]*Laboratory of Medicinal Chemistry, Faculty of Pharmacy and Institute of Biomedicine (IBUB), University of Barcelona (SPAIN).* [b]*Immunology Unit, Department of Pathology and Experimental Therapy, School of Medicine, Universitat de Barcelona, 08907 L'Hospitalet de Lloberegat (SPAIN).* [c]*Immunity, Inflammation and Cancer Group, Oncobell Program, Institut d'Investigació Biomèdica de Bellvitge-IDIBELL, 08907 L'Hospitalet de Llobregat (SPAIN).*

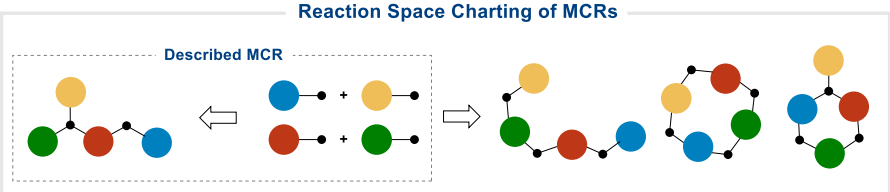
e-mail: ghashghaei@ub.edu

Keywords: *Multicomponent Reactions, Reaction Discovery, Chemical Diversity, Drug Discovery*

Reaction space charting aims to explore and describe a chemical transformation to fully understand the processes involved. In this way, the studied system can be exploited to extend its reach or develop new applications. Charting is particularly appealing in reaction discovery, as it enables the discovery of previously unknown reaction pathways and the development of new processes.[1]

In this context, multicomponent reactions (MCRs), which combine three or more reactants to generate a unified adduct, epitomize the need for reaction space charting due to their inherent complexity (number of reactants, reactive intermediates, potential reaction pathways, etc.). Our group has applied the charting approach to address the multiparametric nature of MCRs with the aim of expanding their synthetic reach, gaining further mechanistic insights, and eventually developing meaningful applications in drug discovery and biomedicine.[2]

As a representative example, a thorough mapping of the interactions among carbonyls, amines, and isocyanoacetates led to the discovery of new multicomponent processes through novel reaction pathways, thereby achieving vast chemical diversity from simple, off-the-shelf reagents. The heterocyclic nature of the generated scaffolds renders them well-suited for biomedical applications, and the streamlined synthetic access enables rapid construction of chemical libraries, which are critical in medicinal chemistry research.[3] Ongoing collaborations with biological research groups focus on studying these applications.



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Name：Hanmin Huang

Affiliation: University of Science and Technology of China

Address: 96 Jinzhai Road, Baohe District, Hefei, Anhui, China

Email: hanmin@ustc.edu.cn

Short biography:

Hanmin Huang was born in Hubei, China, and completed his M.S. degree at the Huazhong University of Science & Technology. He obtained his Ph.D. degree in 2003 from the Dalian Institute of Chemical Physics, Chinese Academy of Sciences (CAS). He then moved to Nagoya University and worked as a JSPS postdoctoral research fellow with Professor Masato Kitamura. In April 2008, he returned to China and initiated his independent research at the Lanzhou Institute of Chemical Physics, CAS as a full professor financed by the ‘‘Hundred-Talent’’ program of CAS. In March 2016, he moved to the University of Science and Technology of China (USTC) as a chair professor. His current research interests are focused on the chemistry of organometallic complexes stabilized by adjacent heteroatoms. Particular attention is being paid to the design of new catalysts and leading complexes as key intermediates for developing novel synthetic methodologies and efficient transformation of nitrogen-containing molecules.

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Aminoalkyl Cyclopalladated Complex: Discovery and Synthetic Applications

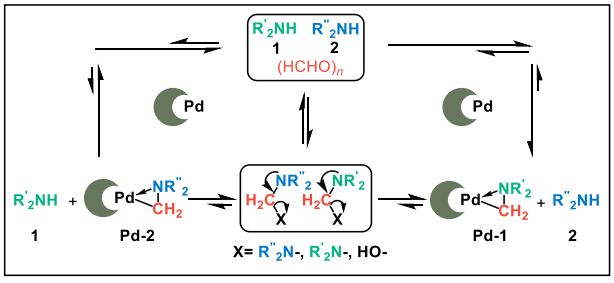
Hanmin Huang

Department of Chemistry, University of Science and Technology of China

e-mail: hanmin@ustc.edu.cn

Keywords: *cyclopalladated complex, aminoalkylation, C-N bond metathesis, adaptive DKR*

The rapid development of transition metal catalysis has drastically expanded chemists' capability to construct chemical bonds, enabling a broad range of efficient carbon−carbon and carbon−heteroatom coupling protocols that are highly desirable for synthetic organic chemistry. Such remarkable success can be largely attributed to the discovery and identification of new reactive organometallic intermediates and insights into the fundamental chemistry of these well-defined "leading complexes". In this context, it is recognized that the discoveries, preparations, and detailed reactivity investigations of these well-defined organometallic "leading complexes" are vitally important to the development of new and effective catalytic transformations, and to tackling the challenges in synthetic chemistry in general. In past ten years, we have developed a "nitrogen-containing C-bound complex" as the key intermediate for new catalytic aminoalkylation reactions, in which the ligand moiety was C-bound instead of N-bound to the late transition metal center.[1] The complex could introduce an electron-donating amine group from metal−aminoalkyl species into the target product through C−C bond formation instead of through C-N bond construction via late transition metal-amido species. With these general concepts in mind, our group designed and prepared a Pd−aminoalkyl complex, which has exhibited unique and versatile reactivities in various types of aminomethylation reactions. In this talk, we will present our recent progress in this project.[2]



Scheme 1

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Name：Rongrong Hu

Affiliation: South China University of Technology

Address: Wushan Road381, Tianhe District, Guangzhou, China

Email: msrrhu@scut.edu.cn

Short biography:

Rongrong Hu is a Professor of Stable Key Laboratory of Luminescent Materials and Devices at South China University of Technology. She obtained her B. S. degree at Peking University and her Ph.D degree at Hong Kong University of Science and Technology. She started her independent career at South China University of Technology in 2014, and was promoted to full professor in 2016. She became Fellow of Royal Society of Chemistry in 2021, and served as the associate editor of Polymer Chemistry since 2019. Her research interests are establishing new polymerization reactions, exploring new polymer structures, and developing new polymer materials. Her research group has developed more than 30 types of multicomponent polymerizations, including a series of elemental sulfur-based multicomponent polymerizations, which could directly convert sulfur to a large number of sulfur-containing functional polymer materials efficiently. She has published more than 150 SCI papers, including JACS, Chem, Chem. Sci., Macromolecules, which been cited for more than 10000 times. She has been the recipient of Hanwha-Total IUPAC Young Scientist Award and Young Chemist Award of Chinese Chemistry Society, and is funded as Distinguished Young Scholar from National Science Fund of China.

The 9th International Conference on
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13-16th Jan 2026

ELEMENTAL CHALCOGEN-BASED MULTICOMPONENT POLYMERIZATIONS

Rongrong Hu[a]

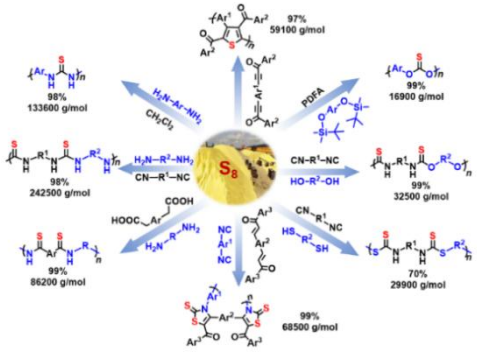
[a]*State Key Laboratory of Luminescent Materials and Devices, South China University of Technology, Guangzhou, 510641*

e-mail: msrrhu@scut.edu.cn

Keywords: *multicomponent polymerization, elemental sulfur, selenium, sulfur-containing functional polymer*

Chalcogen-containing polymers have attracted increasing attention, owing to their fascinating properties such as high refractive indices, metal coordination ability, self-healing capability, optoelectronic property, and so on. Currently, the lack of economic monomers and efficient synthetic approaches are the main challenges for the development of chalcogen-containing polymers. Elemental sulfur with large surplus from worldwide petroluem industry, and elemental selenium as byproduct from metal refinery industry, are hence idea sources for the preparation of chalcogen-containing polymers, despite of the challenges of poor solubility of sulfur/selenium in organic solvents and their toxicity to transition metal catalysts.

In this talk, a series of elemental sulfur-based multicomponent polymerizations (MCPs) will be introduced to directly convert elemental sulfur to sulfur-containing polymers such as polythioamides, polythioureas, polythiocarbonates, and polythiophenes with well-defined structures, good solubility, high yields, and high molecular weights (M_ws) in one step. For example, a KF-assisted MCP of sulfur, CH_2Cl_2, and aromatic diamines has enabled efficient and economic synthesis of various aromatic polythioureas.[1] Moreover, through the efficient room temperature polymerization of elemental sulfur/selenium and alkynone, non-emissive poly(1,4-dithiin)s/poly(1,4-diselenin)s could be afforded, which could be completely transformed to emissive polythiophenes/polyselenophenes upon heating or oxidation.[2,3] These polymers could exhibit tunable thermal properties, mechanical properties,[4] optical characteristics, and degradability, making them promising candidates for applications including precious metal enrichment and recovery, high-refractive-index materials, and solid-state electrolytes. These MCPs are economic, efficient, and convenient tools for the direct conversion from elemental chalcogen to profitable chalcogen-containing functional polymers, which could accelerate the development of chalcogen-containing polymers with diversified structures and functionalities, demonstrating their great potential in sustainable polymer materials.



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Name：Zhenghui Kang

Affiliation: Shanghai Institute of Materia Medica, CAS
Zhongshan Institute for Drug Discovery, CAS

Address: Zhongshan Guangdong 528400, China.

Email: kangzhenghui@simm.ac.cn

Short biography:

Zhenghui Kang, Associate Researcher, Young Principal Investigator, Shanghai Institute of Materia Medica/Zhongshan Institute for Drug Discovery, CAS.
Dr. Zhenghui Kang earned the Ph.D. in Organic Chemistry from East China Normal University in 2018, under the supervision of Professor Wenhao Hu. From July 2018 to January 2022, he conducted postdoctoral research at the School of Pharmaceutical Sciences, Sun Yat-sen University, under the joint guidance of Professor Wenhao Hu. In March 2022, he joined the Shanghai Institute of Materia Medica/Zhongshan Institute for Drug Discovery, Chinese Academy of Sciences, where he serves as an Associate Researcher and Young Principal Investigator. His current research primarily focuses on medicinal chemistry, asymmetric catalysis, and organic synthetic chemistry.

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Multicomponent Reactions Enabled by Metal Carbene Multifunctionalization

Zhenghui Kang,[a] Baofan Wang[a] and Wenhao Hu[b]

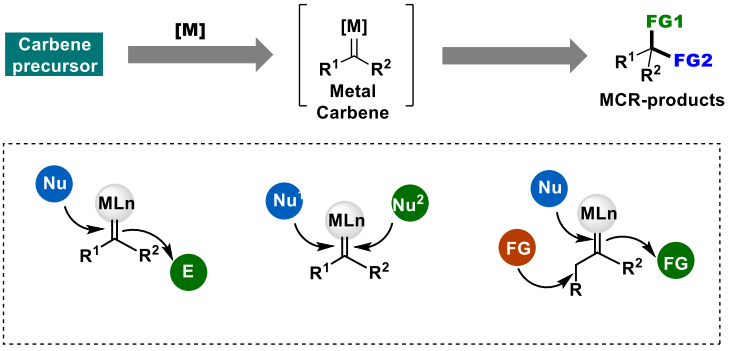
[a] Shanghai Institute of Materia Medica/Zhongshan Institute for Drug Discovery,

[b] Sun Yat-sen University

e-mail: kangzhenghui@simm.ac.cn

Keywords: *Metal carbenes, Multicomponent reaction,* Interception of two active intermediates

Metal carbenes represent a pivotal class of reactive intermediates in organic synthesis. Capitalizing on the ambiphilic character of the carbene carbon, the direct multifunctionalization of this reactive center enables a versatile platform and a powerful strategy for the development of novel multicomponent reactions, wherein carbene species act as C_1 synthons that couple with two partners via interception of reactive intermediates to afford one-carbon-extended products. Herein, we present three distinct multicomponent reaction (MCR) platforms enabled by the multifunctionalization of metal carbenes. These encompass: (i) sequential electrophilic/nucleophilic carbene carbon functionalization; (ii) transformations initiated by electrophilic capture of the carbene followed by a secondary nucleophilic addition; and (iii) a four-component coupling strategy that achieves triple functionalization of metal carbene intermediates. The applications of this methodology in the synthesis of natural products and pharmaceuticals, as well as the reaction mechanism—particularly the nature of the reactive intermediates and the structure of the metal carbene—will be discussed.



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Name：Rodolfo Lavilla

Affiliation: University of Barcelona

Address: Av. de Joan XXIII, 27-31, 08028 Barcelona, Spain

Email: rlavilla@ub.edu

Short biography:

Rodolfo Lavilla studied Pharmacy at the University of Barcelona, and later he obtained an M.S. in Medicinal Chemistry and a Ph.D. in Organic Chemistry there. After a postdoctoral stage at the University of California, San Diego, he entered faculty at the University of Barcelona where he is now full Professor of Organic & Medicinal Chemistry. His research interests deal with heterocyclic chemistry, multicomponent reactions, functional probes, medicinal chemistry and selective peptide modifications. He has published over 150 research articles, reviews, book chapters and patents, and holds collaborations with pharma companies and research groups in medicinal and biological chemistry.

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Heterocyclic Multicomponent Reactions. New Reactivity Trends And Biomed Applications (25 Years Of Mcr Research In Barcelona)

Rodolfo Lavilla[a]

[a]*Laboratory of Medicinal Chemistry, Faculty of Pharmacy and Institute of Biomedicine (IBUB), University of Barcelona (SPAIN).*

e-mail: rlavilla@ub.edu

Keywords: *Azines, Azoles, Heterocycles, Isocyanides, Reaction Discovery, BioMed Applications*

Heterocycles are privileged scaffolds in multicomponent reactions (MCRs), offering unique advantages that set them apart in synthetic chemistry. Their intrinsic reactivity enables the rapid generation of unparalleled structural diversity, provides a fertile platform for reaction discovery, and serves as a powerful tool for the combinatorial synthesis of chemical libraries. Over the past 25 years, our research in Barcelona has explored and expanded the scope of heterocycle-based MCRs, leading to the development of novel methodologies and reaction trends.[1] Given that the majority of approved drugs contain heterocyclic frameworks, the scaffolds obtained through these processes are inherently well-suited for medicinal chemistry and drug discovery. Our approach facilitates the efficient exploration of the MCR-related chemical space, a critical step in establishing robust structure–activity relationships (SAR).[2] In this presentation, we will highlight representative examples, illustrating how heterocyclic MCRs can accelerate the identification of bioactive compounds and open new avenues in biomedical research.

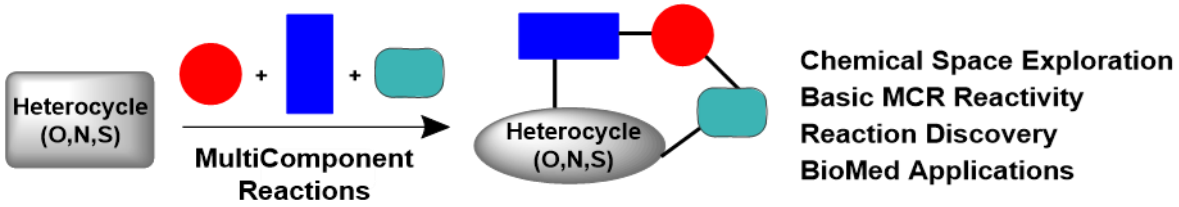

Figure 1. Heterocycle-based MCRs.

Acknowledgements

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Name：Jun-Long Li

Affiliation: College of Pharmacy, Chengdu University, PR China

Email: lijunlong709@hotmail.com

Short biography:

Jun-Long Li is a distinguished professor serving as the Vice Dean of the College of Pharmacy at Chengdu University and Deputy Director of the Sichuan Institute of Industrial Drug Discovery. He earned his Ph.D. from Sichuan University in 2013 and was subsequently a German Humboldt Scholar (2013-2015).

His primary research focuses on asymmetric catalysis and the synthesis of chiral drugs. Professor Li is a recipient of numerous prestigious accolades, including the National Young Chang Jiang Scholar award, and high-level provincial talent titles such as the Sichuan Emei Plan and Sichuan Outstanding Young Scholar.

As a principal investigator, he has led three national research projects, including grants from the National Natural Science Foundation of China. His scientific contributions have been recognized with several awards, including the First Prize of Sichuan Science and Technology Progress Award and the international Thieme Chemistry Journals Award.

He has authored over 60 influential publications in leading international journals, including *Nature Catalysis*, *Science Advances*, *Chemical Society Reviews*, *Journal of the American Chemical Society*, and *Angewandte Chemie International Edition*.

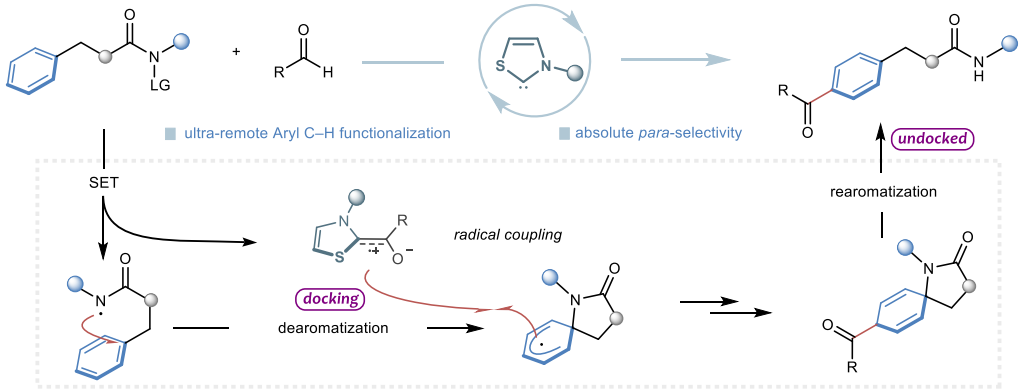
Remote Site-selective Arene C–H Functionalization Enabled by N-Heterocyclic Carbene Organocatalysis

Jun-Long Li

College of Pharmacy, Chengdu University, PR China

e-mail: lijunlong709@hotmail.com

Catalytic site-selective functionalization of distal C–H bonds represents a formidable challenge in organic synthesis. Particularly, the precise functionalization of distal aromatic C(sp2)–H bonds remain largely unexplored. Here we present a highly para-selective acylation strategy to target ultra remote aryl C(sp2)–H bonds, eight chemical bonds away from an activated functionality, through radical N-heterocyclic carbene organocatalysis. This method is developed on the basis of a unique single-electron pathway involving the site-selective activation of aryl C–H bonds by a nitrogen-centered radical generated in situ. Importantly, this organocatalytic approach shows potential for the functionalization of drugs, amino acids and peptides, thus highlighting its importance for medicinal chemistry. Our investigation encompassed meticulous mechanistic studies, including control experiments and density functional theory calculations, to unravel the intricacies behind the observed site selectivity and shed light on the mechanism of radical N-heterocyclic carbene organocatalysis.



Scheme 1. *N*-radical-directed *para*-selective acylation of ultraremote arene C–H bonds.

Name：Zhong Lian

Affiliation: National Key Laboratory of Biotherapy, West China Hospital, Sichuan University

Email: lianzhongchem@163.com

Short biography:

Zhong Lian, a professor at Sichuan University, has been selected for the Youth Program of the Thousand Talents Plan by the Central Organization Department, the Thousand Talents Plan of Sichuan Province, and has been recognized as an academic leader by the Sichuan Provincial Health Commission. He obtained his bachelor's degree in 2009 from East China Normal University, under the supervision of Prof. Hong Ran (Shanghai Institute of Organic Chemistry); in 2012, he earned his master's degree from the Shanghai Institute of Organic Chemistry, under the guidance of Prof. Shi Min; and in 2015, he completed his PhD at Aarhus University in Denmark, under the supervision of Prof. Troels Skrydstrup. From 2016 to 2018, he conducted postdoctoral research in the Prof. Bill Morandi's research group at the Max Planck Institute for Coal Research in Germany. Since May 2018, he has been a full professor at Sichuan University. His main research focuses on mechanical synthetic chemistry.

Mechanical Synthetic Chemistry

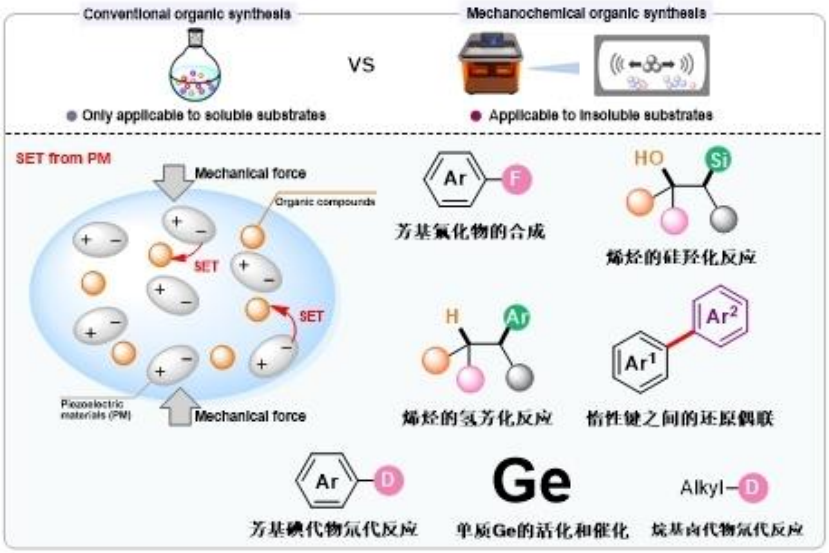
Zhong Lian

National Key Laboratory of Biotherapy, West China Hospital, Sichuan University

e-mail: lianzhongchem@163.com

Keywords: Mechanochemistry, Piezoelectric catalysis

Mechanochemistry, a green and sustainable approach to chemical synthesis conducted under solvent-free or solvent-minimized conditions, has had a profound impact on synthetic chemistry. The piezoelectric effect describes how certain crystalline materials, when subjected to mechanical stress, undergo changes in their internal charge distribution that generate an electric field or voltage. Under mechanical force, polarized piezoelectric materials facilitate single-electron transfer reactions, opening new avenues for radical-based solid-state synthesis. Leveraging this principle, we have achieved the Balz–Schiemann reaction and the hydroxysilylation of alkenes under mild conditions. We have also developed a novel piezo-catalytic pathway—continuous mechanical force–induced electron transfer (ConMET)—enabling dehalogenative deuteration of aryl and alkyl halides and the hydroarylation of alkenes. In addition, we have utilized mechanical force to activate and catalyze elemental germanium and to promote reductive coupling reactions between aryl fluorides and aryl ethers, among other transformations.



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Name：Xiaohua Liu

Affiliation: Sichuan University, PR China

Email: liuxh@scu.edu.cn

Short biography:

Xiaohua Liu received her B.S. degree from Hubei Normal University in 2000 and M.S. degree and Ph.D. from Sichuan University in 2003 and 2006 sequentially. She joined the faculty of Prof. Feng's group at Sichuan University, where she was promoted to professor in 2010. Her current research interests include chiral catalyst design and novel asymmetric catalysis, bioactive molecule synthesis, and reaction mechanisms. She has developed a new type of chiral guanidine-amide compounds, which can serve as organocatalysts and chiral ligands for transition metal catalysis. To date, she has published over 180 papers and received many awards and honors, including the Young Female Scientist Award of China, the Chinese Chemical Society and Royal Society of Chemistry Young Chemistry Prize, the State Natural Science Award of China (Second class) and so on.

Asymmetric multicomponent reaction catalyzed by chiral metal complexes

Xiaohua Liu

Sichuan University, PR China

e-mail: liuxh@scu.edu.cn

Asymmetric multicomponent reactions demonstrate an efficient access to complex chiral molecules from simple materials. This one pot strategy features simple operation, step economy, and environmental friendliness, which has been widely applied in modular synthesis and drug discovery. Nevertheless, this approach faces competition from two-component reactions and challenges in stereocontrol over highly reactive intermediates. In the past few years, our group developed several asymmetric multicomponent reactions mediated by chiral metal complexes, including copper(I)-catalyzed asymmetric C–H insertion/1,3-copper shift/nucleophilic addition for synthesis of chiral tetrasubstituted allenoates, asymmetric azide-alkyne cycloaddition/[2+2] cascade reaction for synthesis of chiral spiroazetidinimine oxindoles, asymmetric hydrocyanation/Michael reaction for synthesis of chiral cyanide-containing pyrrolidine-2,5-diones, asymmetric photoinduced asymmetric cyanoalkylalkynylation for synthesis of chiral alkyne-bearing nitriles, iron(II) or ytterbium(III)-catalyzed enantioselective difunctionalization of α,β-unsaturated carbonyl compounds, such as haloazidation, carboazidation, diazidation, and *anti*-dihalogenation, enabling synthesis of chiral azides and dihaloalkanes, as well as organocatalyst/palladium(0) synergistically catalyzed 1,4-addition/arylation tandem reaction for synthesis of chiral tetrasubstituted allenes. In these reactions, detailed mechanisms were studied to elucidate the reaction process and enantioinduction.

Name：Xin-Yuan Liu

Affiliation: Southern University of Science and Technology

Address: Department of Chemistry,Southern University of Science and Technology, Shenzhen, P. R. China 518055

Email: liuxy3@sustech.edu.cn

Short biography:

Prof. Dr. Xin-Yuan Liu, Chair Professor and Department Head of Chemistry at SUSTech. As the corresponding author, he has published over 110 papers on "Asymmetric Catalytic Radical Chemistry" in top-tier journals such as Science (1), Nature (1), Nat. Chem. (5), Nat. Catal. (3), Nat. Synth. (2), Chem (2), JACS (13), Angew. Chem. (21), etc. He has obtained many honors and awards, such as XPLORER prize, The First-Class Prize of the Natural Science Award of Guangdong Province, Boehringer Ingelheim Lectureship (Boston College), The National Science Fund for Distinguished Young Scholars, The National Science Fund for Excellent Young Scholar, The Scholar Program-Youth Project (Ministry of Education, China), CCS-BASF Innovation Prize, CCS Youth Chirality Award, The Distinguished Lectureship Award (Chemical Society of Japan), CAPA Distinguished Faculty Award (CAPA), ACP Lectureship Awards (Taiwan District, Japan and Korea), etc.

Cu/Chiral Anionic Ligand-Catalyzed Enantioselective Cross-Couplings

Xin-Yuan Liu

Department of Chemistry, Southern University of Science and Technology，ShenZhen, China.

e-mail: liuxy3@sustech.edu.cn

Keywords: *Radical, Chiral Anionic*

Radical reactions have emerged as one of the most powerful and efficient tools for the construction of carbon–carbon and carbon–heteroatom bonds in organic synthesis. However, the development of catalytic asymmetric radical reactions to realize the stereochemical control of open-shell intermediates still remains a formidable challenge owing to the high reactivity of such free radical species. To solve this problem, our group has developed copper(I)/chiral anionic ligand catalyst to achieve a number of enantioselective radical transformations: such as the C–H functionalization, alkene difunctionalization and cross–coupling of alkyl halides, etc. The role of chiral anionic ligand is dual: it not only tunes the reducing capability of copper for the reaction initiation but also provides excellent stereocontrol induction of the reactive radical species through multiple models.

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Name：Thomas J. J. Müller

Affiliation: Heinrich Heine University Düsseldorf

Address: Institute of Organic Chemistry and Macromolecular Chemistry, Universitätsstr. 1, D-40225 Düsseldorf, Germany

Email: thomasjj.mueller@hhu.de

Short biography:

Thomas J. J. Müller, born in Würzburg, Germany, in 1964, studied chemistry (1984-1989) at the University of München (LMU) (diploma 1989; Ph.D. 1992). After a post-doctoral stay at Stanford University (1993/1994) as a Feodor Lynen fellow (Alexander von Humboldt foundation), he developed his independent research at Technical University Darmstadt and LMU (1994-1999; habilitation 2000) (as recipient of the Liebig fellowship of the Funds of Chemical Industry and the habilitation scholarship of DFG). After a professorship at the University of Heidelberg (2002-2006) he is a chaired full professor at the University of Düsseldorf since 2006, and since 2019 the spokesman of the Research Training Group 2482 funded by the German Science Foundation (DFG). In 2013 he was awarded with First Prize of Evonik Call for Research Proposals (ECRP). He was a member of the board of Liebig Society of Organic Chemistry for two election periods (2016-2023). Since 2021 he is a foreign member of the National Academy of Sciences of Ukraine. He was elected in 2023 as a member of the DFG decision panel on funding of projects in chemistry. He is member of board of several foundations and selection committees. His research interests encompass synthetic and physical-organic chemistry of functional chromophores, and the design of novel one-pot reactions, documented in more than 350 publications.

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Sequentially Pd-Catalyzed Processes – Consecutive Multicomponent Synthesis Of Functional Molecules In Catalyst Economic Fashion

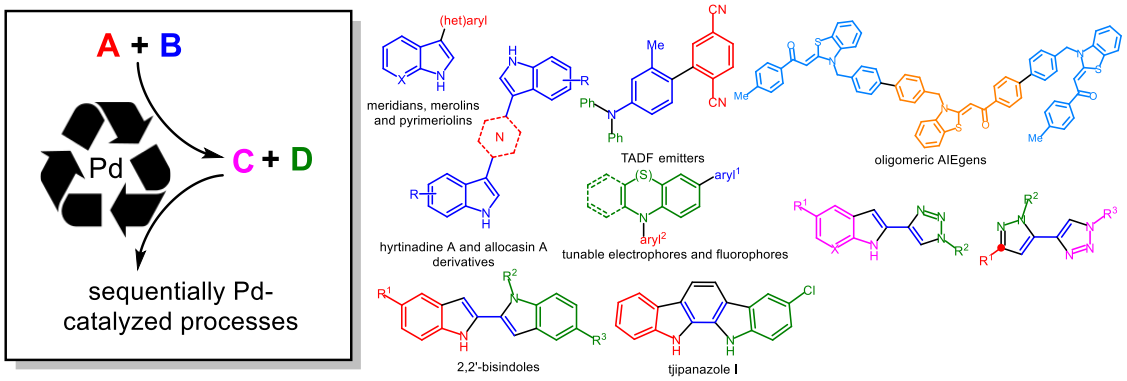
Thomas J. J. Müller[a]

[a] *Heinrich Heine University Düsseldorf, Faculty of Mathematics and Natural Sciences, Institute of Organic Chemistry and Macromolecular Chemistry, Universitätsstr. 1, D-40225 Düsseldorf, Germany*

e-mail: thomasjj.mueller@hhu.de

Keywords: *anti-infectiva, apoptosis inducers, catalysis, consecutive reactions, functional chromophores, multicomponent reactions, palladium*

One-pot reactions – in a consecutive, sequential or domino fashion – are highly efficient and efficacious routes to functional molecules in life and materials sciences. Heterocyclic systems cover a vast spectrum of applications and are therefore highly interesting. Transition metal catalyzed multi-component sequences have raised considerable attention since they enable transformations with high tolerance of functional groups.[1] Likewise, sequentially Pd-catalyzed processes have opened new avenues to one-pot syntheses of numerous classes of heterocyclic frameworks.[2-4] This one-pot methodological concept, in particular the Masuda-Suzuki sequence,[5] is most elegantly applied to the syntheses of various classes of functional heterocycles, ranging from functional chromophores to the key steps in very concise syntheses of marine alkaloids,[6,7] kinase inhibitors,[8] and anti-infectiva.[9,10]



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Name：Romano V.A. Orru

Affiliation:

the Aachen-Maastricht Institute for Biobased Materials (AMIBM)
Faculty of Science & Engineering, Maastricht University

Address:

Brightlands Chemelot Campus, Center Court, Urmonderbaan 22, 6167 RD,
Geleen, The Netherlands

Email: r.orru@maastrichtuniversity.nl

Short biography:

Romano Orru completed his PhD in organic chemistry at the Agricultural University of Wageningen, The Netherlands. From 1996 to 2000 he worked at the Technical as well as at the Karl-Franszens University of Graz, Austria on synthetic applications of bio-transformations. In 2000, he returned to the Netherlands, and was appointed Assistant Professor and later Associate Professor (2003) of Synthetic & Bioorganic Chemistry at Vrije Universiteit Amsterdam, where he was appointed chair in 2007. End of 2019 he moved to the AachenMaastricht Institute for Biobased Materials of Maastricht University as a professor of Organic Chemistry. Early 2022 he became the Scientific Director of AMIBM. His research focuses on the utilisation of one-pot cascade reactions and multi-component reactions to improve the efficiency, sustainability and precision of organic compound synthesis, with emphasis on applications in the field of pharmaceutical science. For that, he develops novel MCRs and employs them in combination with biocatalysts in one-pot processes to access targeted molecules in a stereoselective fashion. In another research line he develops isocyanides as versatile C1 building blocks in (transition) metal-catalyzed insertion reactions towards privileged heterocyclic scaffolds. He is considered a leader in his field and has contributed much to this emerging area

Isocyanides: Chemical Chameleons

Romano V.A. Orru,[a]

[a] *the Aachen-Maastricht Institute for Biobased Materials (AMIBM)*
Faculty of Science & Engineering, Maastricht University
Brightlands Chemelot Campus, Center Court, Urmonderbaan 22, 6167 RD,
Geleen, The Netherlands
e-mail: r.orru@maastrichtuniversity.nl

Keywords: *isocyanides, spirocyclizations, photochemistry, alkaloids, peptoids,*

In the past 15 years we worked on a number of Tandem- and Multi Component Reaction strategies that involve isocyanides. We discovered many interesting new reactions that were applied in a range of chemistry fields, covering medicinal and combinatorial chemistry, catalysis, biotransformations, fotochemistry and natural product synthesis. We have explored classical MCR approaches where isocyanides can act as both electrophiles as well as nucleophiles, biocatalytic asymmetric Ugi-type transformations, but also both transition-metal as well as base-metal mediated and catalyzed insertion chemistry. Recently, we embarked on radical-type chemistry involving isocyanides discovering remarkable charge-transfer behavior in (auto) photocatalysis. In this presentation I will highlight the fascinating chameleonic behavour of isocyanides and show their remarkable value as C1-building blocks in synthetic organic method development.

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Name：Shi-Liang Shi (施世良).

Affiliation: Shanghai Institute of Organic Chemistry
Chinese Academy of Sciences

Address: 345 Lingling Road, Shanghai 200032, China

Email: *shiliangshi@sioc.ac.cn*

Short biography:

Shi-Liang Shi received his Ph.D. in organic chemistry from the University of Tokyo in 2011 under the supervision of Prof. Masakatsu Shibasaki and Motomu Kanai. After one year of postdoctoral research with Prof. Motomu Kanai as a JSPS fellow, he joined the group of Prof. Stephen Buchwald at MIT as a postdoctoral fellow. In the summer of 2016, he started his independent research as a professor at the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences. His research interests focus on the design of chiral NHC ligands and their application to challenging enantioselective catalytic transformations from readily available starting materials.

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Asymmetric NHC-Metal Catalysis

Shi-Liang Shi

Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences, Shanghai 200032, China
e-mail: shiliangshi@sioc.ac.cn

Keywords: chiral NHCs, asymmetric catalysis, C-H activation, cross-coupling, carbonyl addition

The elaboration of multi-components in a single chemical transformation permits a highly simplified organic synthesis with excellent step-economy and atom-economy; however, controlling the chemo-, regio- and enantio-selectivity in these multicomponent reactions is challenging. Thus, the development of suitable chiral ligands for asymmetric multicomponent transformation is highly demanding. Among all the chiral ligands, N-heterocyclic carbene (NHC) ligands, with their distinctive electronic and steric properties, enable the activation of a range of inert substrates. This holds significant promise for metal-catalyzed synthesis. However, designing chiral NHC ligands with high chiral induction ability is challenging due to their mono-coordination and flexible conformation. The privileged chiral NHC ligand is especially rare, which hampers the advancement of chiral NHC-metal catalysis. This report details the development of novel, induced-fit C_2-symmetric chiral NHC ligands, named ANIPE and SIPE, and their application in various challenging enantioselective transition-metal-catalyzed transformations, including alkene functionalization, C-H activation, cross-coupling, and carbonyl addition reactions[1-12].

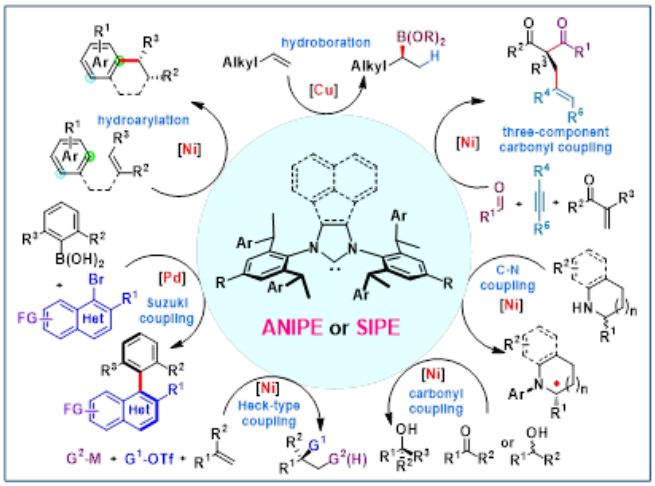

Figure 1. Induced-fit chiral NHC for asymmetric metal catalysis

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Name：Wei Shu

Affiliation: Southern University of Science and Technology

Address: 1088 Xueyuan Avenue

Email: shuw@sustech.edu.cn

Short biography:

Wei Shu is a Principal Investigator with tenure in the Department of Chemistry at the Southern University of Science and Technology (SUSTech). He obtained his B.Sc. from Nankai University and pursued doctoral studies at the Shanghai Institute of Organic Chemistry (Chinese Academy of Sciences) under the guidance of Professors Shengming Ma and Guochen Jia. Following postdoctoral training with Professors Cristina Nevado (University of Zurich), David W. C. MacMillan (Princeton University), and Stephen L. Buchwald (Massachusetts Institute of Technology), he started his independent career at SUSTech in 2018. His research interests span over visible-light catalysis, transition-metal catalysis, asymmetric synthesis, microfluidic chemistry, and medicinal chemistry.

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Catalytic Asymmetric Cross-Hydrodimerization of Hydrocarbons

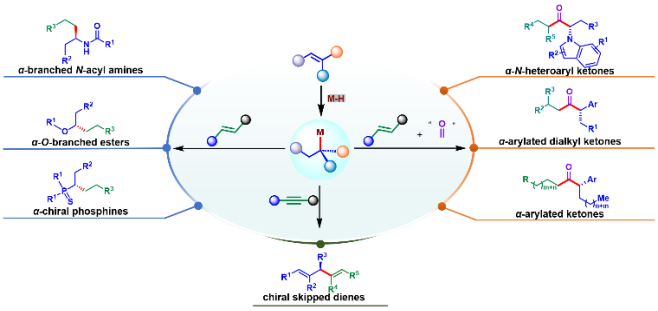
Wei Shu,[a]

[a]*Department of Chemistry, Southern University of Science and Technology, Shenzhen 518055, Guangdong, China*

e-mail: shuw@sustech.edu.cn

Keywords: *Earth-Abundant-Metal-Catalysis, Asymmetric Cross-Hydrodimerization, Unsaturated Hydrocarbons*

Saturated stereogenic carbon centers comprise majority of the framework of organic molecules.[1] However, flexible configuration as well as increased steric hindrance of sp^3 hybridized centers impose challenges for direct constructing such stereogenic centers. Traditional cross-coupling heavily relies on the use of stoichiometric preformed alkyl nucleophiles or/and alkyl electrophiles, which significantly limited the scope and application. Therefore, to develop new cross-coupling reaction modes to build saturated stereogenic carbon centers with the control of regio- and stereochemistry is highly demanding yet challenging.[1] Our interests lie in the development of earth-abundant-metal-catalyzed asymmetric sp^3-cross-coupling reactions, with an emphasis on developing new reaction modes without using stoichiometric alkyl nucleophiles or alkyl electrophiles (Scheme 1).[3]



Scheme 1. Catalytic asymmetric cross-hydrodimerization of unsaturated hydrocarbons

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Name：Voskressensky L.G.

Affiliation: Peoples' Friendship University of Russia, 117198, Moscow, Miklukho-Maklaya str. 6

Email: voskresenskiy-lg@rudn.ru

Short biography:

Prof. Dr. Leonid G. Voskressensky received his PhD degree in Organic Chemistry from the Peoples' Friendship University of Russia in 1999. In 2001 he joined the Prof. Cosimo Altomare (Universita Degli Studi di Bari, Italy) group as a Post-Doc Fellow (Medicinal Chemistry). In 2001 he became Assistant Professor, in 2006, Associate Professor and in 2011, Full Professor of the Organic Chemistry department of the RUDN. Since 2013, he has been the Dean of the Science Faculty of the RUDN University. The scientific interests of his group mainly focus on heterocyclic chemistry (with special emphasis on indole chemistry), domino reactions methodology, new MCR reactions as well as medicinal chemistry. Prof. Voskressensky has a vast experience in the field of heterocyclic chemistry.

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Electron-Deficient Alkynes – Universal Synthons For Producing Condensed Aza-Heterocyclic Systems

Voskressensky L.G.

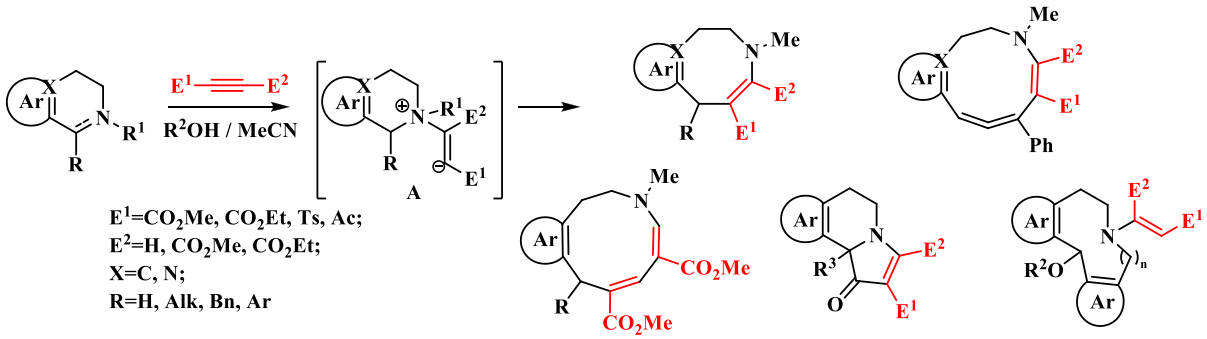
Peoples' Friendship University of Russia, 117198, Moscow, Miklukho-Maklaya str. 6

e-mail: voskresenskiy-lg@rudn.ru

Keywords: *domino reaction, aza-heterocycle, electron-deficient alkynes*

In the synthesis of heterocyclic compounds, electron-deficient alkynes hold a prominent position as key reagents. Activated alkynes, due to their ability to undergo a variety of transformations, have found extensive application in reactions involving nitrogen-containing heterocycles.

We have developed methods for synthesizing annelated nitrogen-containing rings of medium size, specifically 5- and 6-membered rings, which incorporate pharmacophore groups [1-4]. These methods utilize electron-deficient alkynes and alkenes and are based on domino and multicomponent reactions. Many of the resulting compounds demonstrate significant bioactivity.



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Name：Xiaoming Wang

Affiliation: Shanghai Institute of Organic Chemistry (SIOC)

Address: 345 Lingling Lu, Shanghai 200032, P. R. China

Email: xiaoming@sioc.ac.cn

Short biography:

Xiaoming Wang received his B.S. in 2009 from Zhejiang University (China). In 2014, he obtained his Ph.D. from Shanghai Institute of Organic Chemistry under the supervision of Prof. Kuiling Ding. In the following years, he did his post-doctoral research with Prof. Frank Glorius at Münster University (Germany) and Prof. Kyoko Nozaki at University of Tokyo (Japan) respectively. Since 2019, he joined Shanghai Institute of Organic Chemistry as a professor. His current research interests focus mainly on the development of novel binuclear metal catalysts and synthetic strategies via bi- and multi-nuclear metallic catalysis.

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Biphosphine Ligand Enabled Dirhodium-Catalyzed Carbene Difunctionalization

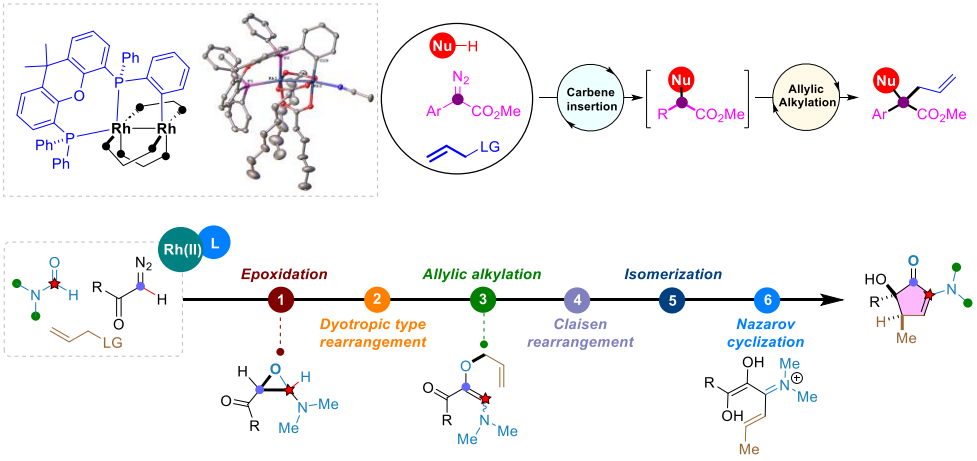
Xiaoming Wang

State Key Laboratory of Organometallic Chemistry, Shanghai Institute of Organic Chemistry, University of Chinese Academy of Sciences, Chinese Academy of Sciences

e-mail: xiaoming@sioc.ac.cn

Keywords: *dirhodium, difunctionalization of carbene; three-component reactions, bimetallic catalysis*

Dirhodium complexes represent a prominent class of dinuclear metal catalysts, widely recognized for their exceptional efficiency in carbene transfer reactions. However, their catalytic versatility has been constrained by the limited ability of dirhodium(II) species to undergo two-electron oxidative addition. To overcome this limitation, we introduced biphosphine ligands to modulate the electronic and catalytic properties of dirhodium centers. This strategic modification facilitates oxidative addition and expands the reactivity profile of dirhodium beyond classical carbene-mediated transformations. Leveraging this approach, we developed a series of efficient and novel diazo difunctionalization reactions. Notably, a three-component coupling of amines, diazo compounds, and allylic substrates was achieved under dirhodium(II)/Xantphos catalysis, affording α-quaternary α-amino acid derivatives with high atom and step economy. Mechanistic studies support a relay process involving dirhodium-catalyzed carbene insertion followed by allylic alkylation, wherein ligand coordination critically enhances catalytic activity in the allylic alkylation step. Furthermore, with dimethylformamide (DMF) as solvent, the system enabled an unprecedented six-step domino process involving C=O bond cleavage and skeletal reorganization. This transformation catalyzed by dirhodium/Xantphos, formally inserts a carbenic carbon into the C=O bond of formamide, with concurrent migration of the α-substituent, yielding cyclopentenone derivatives. Key steps include epoxidation, dyotropic type rearrangement, allylic alkylation, Claisen rearrangement, isomerization, and Nazarov cyclization.



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Name：Ludger A. Wessjohann, Prof. Dr.

Director Dept. Bioorganic Chemistry
& Full Professor of Natural Product Chemistry
Leibniz Institute of Plant Biochemistry (IPB)
Address: Weinberg 3, 06120 Halle (Saale), Germany
Tel: +49 (345) 5582-1301, Fax: +49 (345) 5582-1309
E-mail: wessjohann@ipb-halle.de
http://www.ipb-halle.de/en/research/bioorganic-chemistry/
Orcid: 0000-0003-2060-8235

Short biography:

Professor Wessjohann studied organic chemistry in Hamburg (Germany), Southampton (UK) and Oslo (Norway). As Postdoc he worked on the total synthesis of Taxol with Paul Wender at Stanford U. (USA). He is an expert in the chemistry of natural products and their applications. His research spans from analytical via synthetic chemistry to mode of action studies of bioactive compounds, and their application in organisms. For data analyses also proprietary algorithms and informatics tools are developed. The knowledge generated is channelled into applications, e.g. for new drug leads, flavor compounds, or plant protectants. He received numerous scholarships, prizes and honors, e.g. the Microsoft IT Founders Award, or membership in the Brazilian Academy of Science. His research is published in some 600 publications and 30 patent families. h-index >75.

He is a founding PI of the GLACIER world health centre (www.glacieronehealth.org), the German Centre for integrative Biodiversity Research (iDiv), the Leibniz science campus “plant based bioeconomy”, “DiP - digitalization of plant-based value chains”, and other consortia to promote the sustainable use of plant and fungal chemistry in agriculture and health. He founded seven start-up companies and is advisor to science organizations, companies and governments.

Tumor-targeting with MCR-derived drugs and conjugates

Ludger A. Wessjohann & team

Dept. Bioorganic Chemistry, Leibniz Institute of Plant Biochemistry (IPB)
Weinberg 3, D-06120 Halle (Saale), Germany
wessjohann@ipb-halle.de
https://www.ipb-halle.de/en/research/bioorganic-chemistry
ORCID 0000-0003-2060-8235

Although finding new bioactive principles is and will remain a cornerstone of drug development, it commonly is not the activity of a compound that poses an application problem, but bioavailability and specificity to a certain tissue, e.g. cancerous vs. healthy cells. Thus, modifications that improve selectivity and ADME-properties (absorption, distribution, metabolism, excretion) are often more relevant topics than increasing potency, including so called targeting strategies with PDCs/ADCs (peptide/antibody drug conjugates).

MCR technology is ideal to bring various functions in a molecule together in a defined combination. It therefore allows us to not only synthesize the bioactive war head but, ideally in one step, it can introduce linkers, membrane ankers, fluorescent dyes or other functions, or directly link targeting moieties at the same time. Especially useful is the Ugi reaction, as it is insensitive to water and allows us to generate and link peptides. I will present some of our recent works to improve and target bioactive molecules with the support of MCR chemistry in the fields of anticancer, antiinfective, and immunomodulatory applications in human and plant disease.

Name：Hua Wu

Affiliation: Shanghai Jiao Tong University

Address: 800 Dongchuan Road, Minhang District, Shanghai 200240, China

Email: hua.wu@sjtu.edu.cn

Short biography:

Prof. Dr. Hua Wu is Principal Investigator at the School of Pharmaceutical Sciences, Shanghai Jiao Tong University (SJTU), and a recipient of the National Overseas High-Level Young Talent Program and Shanghai Overseas High-Level Young Talent Program. He earned his PhD from the University of Science and Technology of China in 2014 under the supervision of Prof. Liu-Zhu Gong, then pursued postdoctoral research at Swiss Federal Institute of Technology in Lausanne (EPFL) with Prof. Jieping Zhu, before joining SJTU in May 2021. His research interest centers on novel rearrangement reactions for heterocycle synthesis and structural modification. He has won awards such as the Thieme Chemistry Journal Award and the Chinese Academy of Sciences President's Award.

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Rearrangement Reactions-Driven *N*-Heterocycle Synthesis and Modification

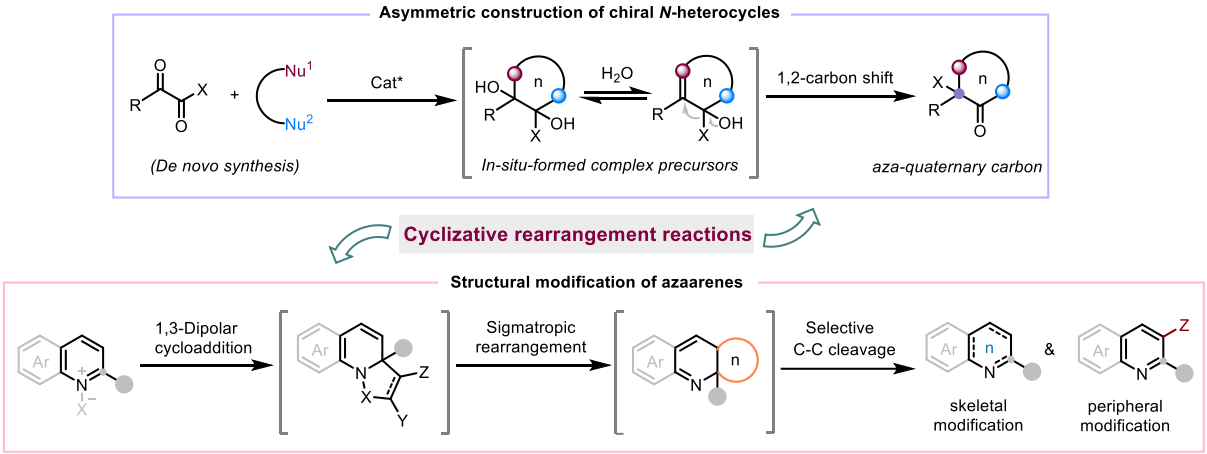
Hua Wu,[a] Di Tian[a] and Xing-Zi Li[a]

[a]*School of Pharmaceutical Sciences, Shanghai Jiao Tong University*

e-mail: hua.wu@sjtu.edu.cn

Keywords: *rearrangement reactions, N-heterocycle synthesis, structural modification, organocatalysis*

To address the challenges of selective synthesis and precise modification of *N*-heterocycles, we focus on rearrangement chemistry as the core and propose an "intermolecular cyclizative rearrangement strategy". Through the strategic integration of cyclization and rearrangement events, we



have devised two-component and multi-component reaction systems that in situ generate transient, highly reactive cyclic intermediates. These species then engage in either directed 1,2-rearrangement or concerted rearrangement pathways, thereby enabling both the streamlined synthesis of *N*-heterocyclic scaffolds and the precise structural modification of azaarenes.

The main research content involves the following two aspects: (1) Based on the cyclizative 1,2-rearrangement strategy of ambielectrophilic-ambinucleophilic reagents, the stereoselective construction of chiral *N*-heterocycles is realized;[1-5] (2) Based on the 1,3-dipolar cycloaddition/concerted rearrangement strategy, the precise skeleton modification and direct C-H functionalization of azaarenes are achieved.[6-8] This strategy combines the advantages of two reaction types, avoids tedious substrate synthesis, drives interdisciplinary innovation in rearrangement and heterocyclic chemistry.

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Name：Wanqing Wu

Affiliation: South China University of China

Address: No. 381 Wushan Road, Tianhe District, Guangzhou 510640, China

Email: cewuwq@scut.edu.cn

Short biography:

Wanqing Wu received her Bachelor's degree from Hunan University in 2005 and her Ph.D. from Peking University in 2010. She then conducted postdoctoral research at South China University of Technology from 2010 to 2013, after which she joined the faculty. She was promoted to Professor in 2014. Her research focuses on the efficient conversion and high-value utilization of unsaturated compounds. To date, she has published over 100 papers in journals such as *Acc. Chem. Res.*, *J. Am. Chem. Soc.*, and *Angew. Chem. Int. Ed.*, and has been granted more than 10 patents. She also received the First Prize of the Natural Science Award from the Ministry of Education (as the third contributor). Her honors include selection for the National Youth Talent Program, the Guangdong Outstanding Young Scientist, the Guangdong Excellent Youth Team, the ChemComm Emerging Investigators, and the Thieme Chemistry Journals Award.

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Heteroatom-Promoted Sequential Conversions of Unsaturated Hydrocarbons

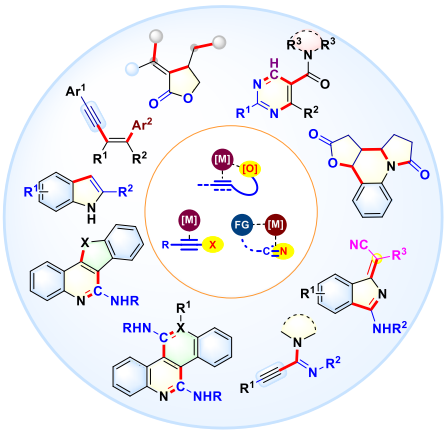
Wanqing Wu[a]

[a] *Key Laboratory of Functional Molecular Engineering of Guangdong Province, School of Chemistry and Chemical Engineering, South China University of Technology, Guangzhou 510640, China*

e-mail: cewuwg@scut.edu.cn

Keywords: *Heteroatom, Unsaturated Bonds, Sequential Conversion*

Unsaturated bonds are important functional groups in organic chemistry. Many useful compounds can be synthesized by the sequential conversion of unsaturated bonds. However, due to the diversity of reaction sites and complex reaction modes of unsaturated bonds [1], it is still a challenge to realize their selective conversions and high-value applications. In recent years, we have developed a series of unique strategies for unsaturated bond conversions involving the directing effect of heteroatoms. By introducing different oxygen- [2], nitrogen- [3] and halogen-atoms [4] into the unsaturated bonds, the orderly coordination between the substrates and transition metals was promoted and precise control of reaction selectivity was realized. Moreover, some novel molecules with excellent biological reactivities and fluorescence performance have been constructed and applied.



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Name: Xuesong Wu (吴雪松)

Affiliation: Huazhong University of Science and Technology

Address: 1037 Luoyu Road, Wuhan 430074, P. R. China

Email: xswu@hust.edu.cn

Short biography:

Xuesong Wu is currently a professor at Huazhong University of Science and Technology (HUST). He received his PhD in organic chemistry from the University of Science and Technology of China in 2012 under the supervision of Professor Shi-Kai Tian. From 2012 to 2017, he did postdoctoral research with Professor Haibo Ge at IUPUI and Professor Vy M. Dong at UC Irvine. In 2018, he joined the School of Chemistry and Chemical Engineering at Huazhong University of Science and Technology as a group leader. His current research interests focus on the development of efficient and practical methods for organic synthesis, involving organic radical chemistry, photochemical synthesis, and asymmetric catalysis.

Light-Driven Multicomponent Radical Reactions with Sulfur-Containing Small Molecules

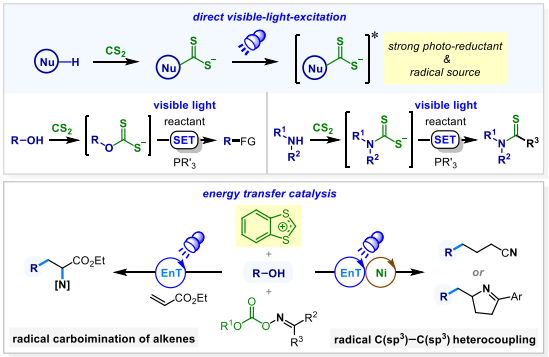
Xuesong Wu (吴雪松)

School of Chemistry and Chemical Engineering, Huazhong University of Science and Technology

e-mail: xswu@hust.edu.cn

Keywords: *radical deoxygenation, thiocarbamoylation, energy transfer, hydrogen atom transfer*

Sulfur-containing organic structures frequently exhibit low redox potentials, low bond energies, and the capacity to stabilize adjacent carbocations and radicals. These characteristics contribute to the high reactivity of sulfur-containing groups and motifs. We have developed a strategy that utilizes sulfur-containing small molecules to convert relatively inert organic molecules into more reactive substances to participate in single electron transfer or hydrogen atom transfer processes. This strategy has been demonstrated to facilitate a series of novel light-driven multicomponent radical reactions, including: 1) Visible-light-promoted deoxygenative radical transformations of diverse primary, secondary, and tertiary alcohols[1] that were enabled by inexpensive carbon disulfide- and phosphine-assisted C–O bond activation via xanthate salt intermediates.[2] 2) Visible-light-driven multicomponent radical reactions of amines, carbon disulfide, and olefins in the presence of phosphines for mild, efficient, and versatile synthesis of acyclic thioamides, as well as γ-thiolactams.[3] 3) Photocatalytic energy transfer (EnT)-driven deoxygenative radical coupling reactions of alcohols with bifunctional oxime carbonates enabled by applying the 1,3-benzodithiolylium (BDT) cation as an efficient hydroxyl-activating reagent.[4]



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Name：Zhenghu Xu

Affiliation: Shandong University

Address: Department of Chemistry, Shandong University, Jinan, China

Email: xuzh@sdu.edu.cn

Short biography:

Zhenghu Xu（徐政虎）

2015.9 – present: Professor, Shandong University

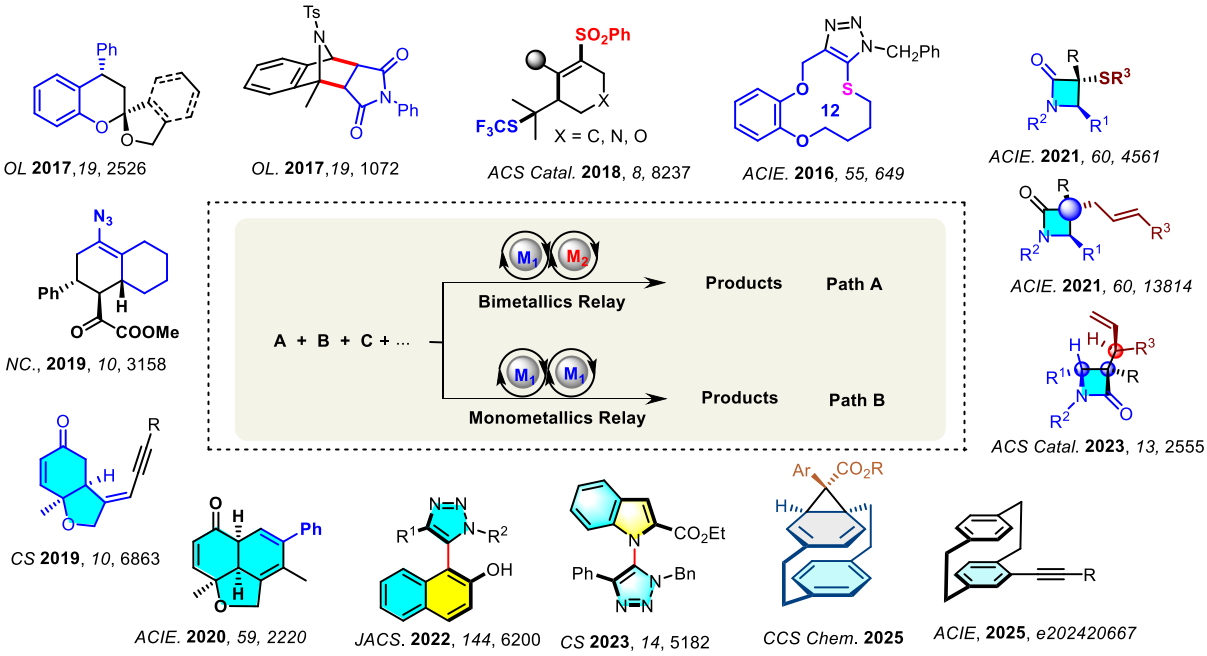
2011.1-2015.9: Associate Professor, Shandong University

2007.10 – 2010.11: Postdoc, Miami University. with prof. Hong Wang

2001.9 – 2007.7: Ph.D. Shanghai Institute of Organic Chemistry
with Prof. Lixin Dai & Yong Tang

1997.9 – 2001.7 B.S. Nanjing University

Research Summary: Tandem Metal Relay Catalysis to polycycles



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Asymmetric Metal Relay Catalysis to Planar chiral [2.2]paracyclophanes

Zhenghu Xu

[a] *Department of Chemistry, Shandong University, Jinan, China*

e-mail: xuzh@sdu.edu.cn

Keywords: *Asymmetric Catalysis, Relay, Planar chiral, paracyclophane*

Planar chirality found tremendous use in many fields, such as chemistry, optics, and materials science. In particular, planar chiral [2.2]paracyclophanes (PCPs) are a type of structurally interesting and practically useful chiral compounds bearing unique electronic and photophysical properties and thus have been widely used in π-stacking polymers, organic luminescent materials, and as a valuable toolbox for developing chiral ligands or organocatalysts. However, the synthesis of chiral PCP derivatives remains a longstanding challenge. Current synthetic methods primarily rely on chiral preparative liquid chromatography separation or chemical and kinetic resolution reactions. Here, we report an enantioconvergent alkynylation of an in situ-formed dehydro-[2,2]-paracyclophane intermediate by asymmetric copper(I) catalysis. This approach enables the efficient synthesis of valuable planar chiral PCP building blocks and heterocycles with good yields and excellent enantioselectivity. The success of this reaction lies in the development of a practical route to access strained dehydro-[2,2]-paracyclophane intermediates, which can also be utilized in various strain-release nucleophilic or cycloaddition reactions to synthesize diverse functionalized PCPs. DFT calculations of this reaction suggest that the enantioselectivity is determined by the aryne complexation with chiral copper(I) acetylide and the subsequent insertion reaction. We anticipate that this new aryne system and its related synthetic applications will provide a new direction in traditional benzyne chemistry. This approach has the potential to serve as a general platform for constructing planar chiral PCPs and could open new avenues for the challenging construction of planar chirality.

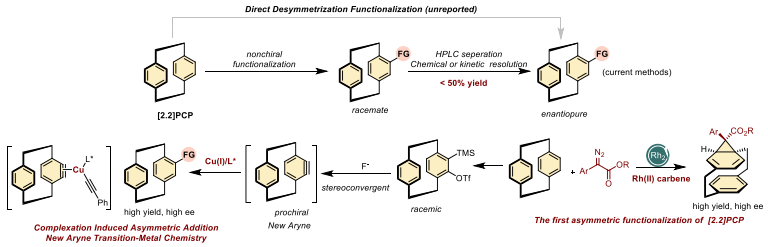

Figure 1. Asymmetric Catalytic route to planar chiral [2,2]PCPs

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Name：Junfeng Yang

Affiliation: Department of Chemistry, Fudan University

Address: 2005 Songhu Road, Shanghai 200438, China

Email: jfyang@fudan.edu.cn

Short biography:

Junfeng Yang received his B.S. degree from Zhengzhou University and obtained his Ph.D. in 2014 from Nanyang Technological University (NTU), Singapore. Following his doctoral studies, he conducted postdoctoral research in the group of Prof. Naohiko Yoshikai at NTU from 2014 to 2018. He joined the Department of Chemistry at Fudan University in 2019, where he currently serves as associate professor. Dr. Yang is a recipient of the National “Ten Thousand Talents Program” for Young Top-Notch Talents and has published over 40 scientific publications.

Pd-Catalyzed Asymmetric Three-Component Coupling of *N*-Sulfonylhydrazones

Junfeng Yang

Department of Chemistry, Fudan University, China

e-mail: jfyang@fudan.edu.cn

Keywords: *Pd, carbene, N-Sulfonylhydrazones, Sadphos*

In recent years, the selective transformation of *N*-tosylhydrazones into functionalized molecular scaffolds has attracted significant attention; however, achieving enantiocontrol in these reactions remains a formidable challenge. By designing specialized sulfinamide–phosphine ('Sadphos') ligands, we have successfully harnessed the high reactivity of palladium carbenes, converting them into powerful tools for the precise construction of congested chiral centers via a modular enantioselective assembly strategy. This approach has enabled the development of a series of multicomponent reactions (MCRs) utilizing metal carbene intermediates.[1] Furthermore, DFT-based mechanistic investigations suggest that the enantio-determining step involves a concerted carbene formation and migratory insertion process, facilitated by the pronounced structural adaptability and flexible coordination behavior of the Sadphos ligands.

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Name： Guoyin Yin (阴国印)

Affiliation: Wuhan University

Address: Bayi Road 299, Wuhan, Hubei Province, China

Email: yinguoyin@whu.edu.cn

Short biography:

Guoyin Yin (阴国印), Professor and Associate Dean at the Institute of Advanced Studies of Wuhan University. He received his bachelor's degree from Northeast Agricultural University in 2006 and earned his Ph.D. from the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences in 2011. Subsequently, he conducted postdoctoral research at the Technical University of Munich, RWTH Aachen University in Germany, and the University of Delaware in the United States. In September 2016, he joined the Institute of Advanced Studies of Wuhan University as a principle investigator and was promoted to Professor in 2021. His research focuses on transition metal-catalyzed chain-walking catalysis and multicomponent reactions of alkenes.

Nicekel Chain-Walking Catalysis For Multicomponent Alkene Functionalization

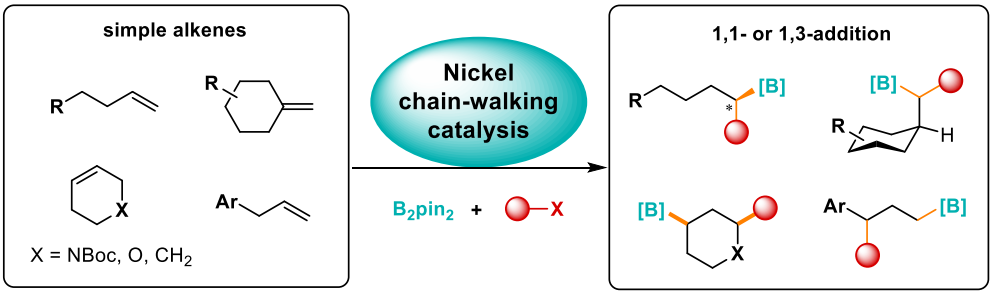
Guoyin Yin

Wuhan University

E-mail: yinguoyin@whu.edu.cn

Keywords: *Chain-walking catalysis, nickel, alkene functionalization, 1,n-addition(n≠2)*

Chain-walking offers extensive opportunities for innovating synthetic methods that involve constructing chemical bonds at unconventional sites. This approach provides previously inaccessible retrosynthetic disconnections in organic synthesis. Through chain-walking, transition metal-catalyzed alkene difunctionalization reactions can take place in a 1, n-addition (n≠2) mode. Unlike classical 1,2-regioselective difunctionalization reactions, there remains a scarcity of reports regarding migratory patterns. Moreover, the range of olefins utilized in these studies is quite limited. The Yin group focuses on developing valuable migratory difunctionalization reactions of alkenes through chain-walking. Our focus was on carboboration of alkenes utilizing nickel catalysis. The incorporation of a versatile boron group introduces a wealth of possibilities for subsequent diversifications, significantly enhancing the value of the resulting products and allowing for the creation of a broader range of valuable derivatives and applications.



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Name：Min Zhang

Affiliation: South China University of Technology

Address: Wushan Road, Tianhe District, School of Chemistry and Chemical Engineering, Building-15

Email: minzhang@scut.edu.cn

Short biography:

From 2003 to 2006, Professor Zhang Min pursued a joint master's training program at Jinan University and the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences. Between 2006 and 2009, he engaged in a joint doctoral training program at the University of Rennes 1 in France (Prof. Pierre. H. Dixneuf) and South China University of Technology (Prof. Jiang, H. F.), graduating with doctoral degrees from both institutions. Subsequently, he conducted research as an Alexander von Humboldt Fellow and postdoctoral researcher in Germany (Prof. Beller M). In 2014, he began his independent research career at South China University of Technology. Currently, he is primarily engaged in fundamental research in green and sustainable catalytic organic synthesis chemistry, as well as industrial application studies in areas such as resins and cleaning agents.

Catalytic reduction-specified tandem reactions

Min Zhang[a]

[a]*School of Chemistry and Chemical Engineering, South China University of Technology, Guangzhou 510641, China*

e-mail: **minzhang@scut.edu.cn**

Keywords: *Reductive tandem reactions, functional N-molecules, sustainable catalysis and synthesis*

By employing unsaturated nitrogen-containing aromatics as the fundamental feedstocks, our group has been focusing on the utilization of their reductive intermediates to develop new tandem reactions in recent years (Fig. 1), and the develped synthetic methods were further applied for streamline synthesis of functional molecules such as biomedicals, ligands, dyes, polymers, etc. By employing different strategies, the talk will present precise *in situ* interception of single reductive intermediates among multiple ones to develop tandem reactions involving both C–C and C–N bond formations. The contents will cover the following two sections: (1) Reductive functionalization of N-heteroarenes.[1] (2) Reductive tandem reactions for direct and diverse construction of functional N-containing molecules with abundantly available nitroarenes.[2]

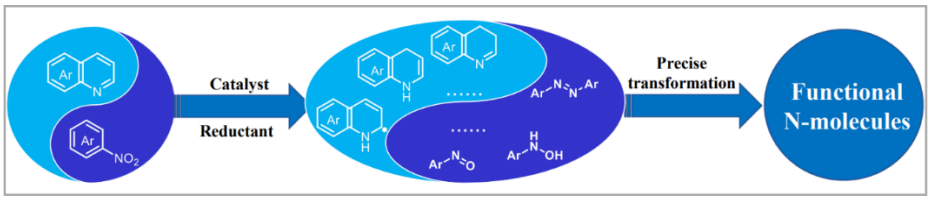

Figure 1. Reduction-specified tandem reactions

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Name：Wei Zhang

Affiliation: University of Massachusetts Boston, USA

Email: *e-mail: wei2.zhang@umb.edu*

Short biography:

Dr. Wei Zhang is a professor and former Director of the Center for Green Chemistry at the University of Massachusetts Boston. His previous positions include Research Assistant Professor at the University of Pittsburgh, Senior Chemist at DuPont, and Director at Fluorous Technologies, Inc. His current research is in the areas of organic synthesis, organocatalysis, drug discovery, and green chemistry. He has coauthored over 260 papers including three in *Chem. Rev.* on synthetic radicals and fluorous technologies, 6 patents and patent applications on drug discovery, and three books on green synthesis. He has been serving as editor and editorial advisory member on nine international journals.

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13-16th Jan 2026

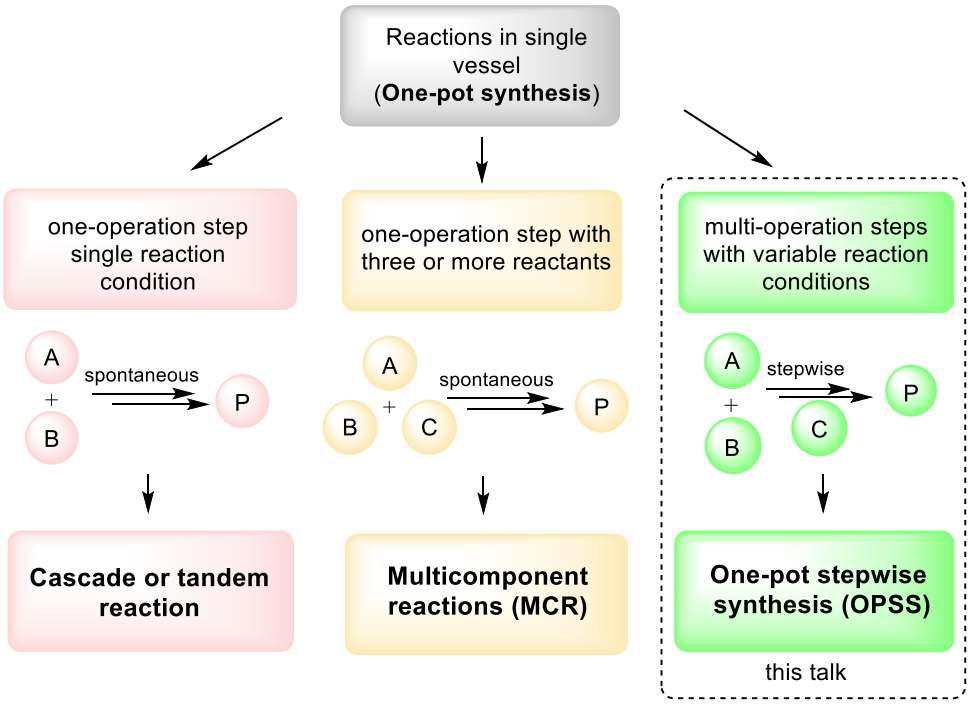
Integrated One-Pot Stepwise Synthesis And Organocatalysis

Wei Zhang

Department of Chemistry and Center for Green Chemistry
University of Massachusetts Boston, MA 02125 USA
e-mail: wei2.zhang@umb.edu

Keywords: *One-pot synthesis, multicomponent reaction, cascade reaction, stepwise synthesis*

One-pot synthesis is an active topic in organic chemistry due to its intrinsic advantages of simple operation, high mass efficiency, low cost, and less waste. Among three kinds of one-pot syntheses 1) cascade reactions, 2) multicomponent reactions (MCRs), and 3) one-pot stepwise synthesis (OPSS), OPSS could be more flexible and practical since it is carried out step wisely and have variable reaction conditions at different steps. This presentation highlights the recent development in our lab on the development of OPSS involving cyclization, cycloaddition, rearrangement, and organocatalysis for the synthesis of heterocyclic scaffolds, asymmetric molecules, and bioactive compounds.



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Name：Xingang Zhang

Affiliation: Shanghai Institute of Organic Chemistry, CAS

Address: Lingling Road 345, Shanghai, 200032

Email: xgzhang@sioc.ac.cn

Short biography:

Xingang Zhang obtained his BSc degree in 1998 from Sichuan University (China) and his Ph.D. in 2003 at the Shanghai Institute of Organic Chemistry (SIOC), Chinese Academy of Sciences. After his postdoctoral work at the University of Illinois at Urbana Champaign (USA), he joined the faculty team of SIOC as a research associate professor in 2008 and became a research professor in 2012. His current research interests are focused on organofluorine chemistry and chemical biology. He received the National Science Fund for Distinguished Young Scholars (2014), the RSC Fluorine Chemistry Prize (2015), the Chinese Chemical Society (CCS)-Royal Society of Chemistry (RSC) Young Chemist Award (2015), the CCS Wei-Yuan Huang Fluorine Chemistry Prize (2021), and the First Prize of the Shanghai Natural Science Award (2023).

Metal Difluorocarbene-Involved Catalytic Coupling

Xingang Zhang

Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences

345 Lingling Road, Shanghai 200032, China

e-mail: xgzhang@sioc.ac.cn

Keywords: *organofluorine chemistry, metal difluorocarbene, catalytic coupling*

Difluorocarbene is a highly reactive intermediate with a singlet ground state and is widely used in the synthesis of fluoropolymers, such as Teflon. Owing to its ability to form two chemical bonds, compared with fluorine-containing carbocations, carbanions, and free radical intermediates, difluorocarbene is capable of expanding the chemical space and efficiently creating novel organofluorine molecules. However, the high reactivity of difluorocarbene limits its reaction types and makes it difficult to apply in controllable organic synthesis. Theoretically, coordination of transition metals with difluorocarbene would alter the electron density distribution of difluorocarbene, thereby providing a possibility for modulating its reactivity. However, the transition metal difluorocarbene complexes isolated so far lack catalytic reactivity, and catalytic reactions involving metal difluorocarbenes pose a long-standing challenge. In 2015, we discovered the first catalytic coupling reaction involving a metal difluorocarbene.[1] This presentation will mainly introduce the latest progress in palladium and copper difluorocarbene chemistry.[2-7]

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Name：Guangfan Zheng

Affiliation: Northeast Normal University

Address: Department of Chemistry, Northeast Normal University,
Changchun China 130024

Email: zhenggf265@nenu.edu.cn

Short biography:

Guangfan Zheng was born in 1988 in Yanbian, Jilin, China. He is currently a Professor and Doctoral Supervisor at the School of Chemistry, Northeast Normal University (NENU). He earned his B.S. in Chemistry from Jilin University in 2010, and completed his Ph.D. at NENU in 2017 under the guidance of Professors Qian Zhang and Haizhu Sun. Following his Ph.D., he served as an Assistant Researcher at the Dalian Institute of Chemical Physics, Chinese Academy of Sciences (2017–2018). He then transitioned to Shaanxi Normal University as an Associate Professor (2018–2020), where his research centered on C–H bond activation and asymmetric catalysis. In December 2020, he returned to NENU as a faculty member and was promoted to Professor in 2025. His independent research focuses on radical chemistry and asymmetric catalysis, with an emphasis on developing novel radical cascade reactions and catalytic strategies to enable high-value transformations of readily available substrates such as alkenes, aldehydes, and carboxylic acid derivatives. He has published over 30 SCI-indexed papers as first or corresponding authors in leading journals including *Nature Commun., Science Adv., Angew. Chem. Int. Ed. and CCS Chemistry.* He also contributed a chapter to a handbook on C–H activation. His academic honors include selection for the Organic Chemistry Frontiers Emerging Investigator Series (2022–2023), the Special Support Grant from the China Postdoctoral Science Foundation (2019), and the Outstanding Doctoral Dissertation Award of Jilin Province (2017). Homepage: https://www.x-mol.com/groups/Zheng_Guangfan.

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13-16th Jan 2026

Multicomponent Radical Reactions Leveraging the Persistent Radical Effect.

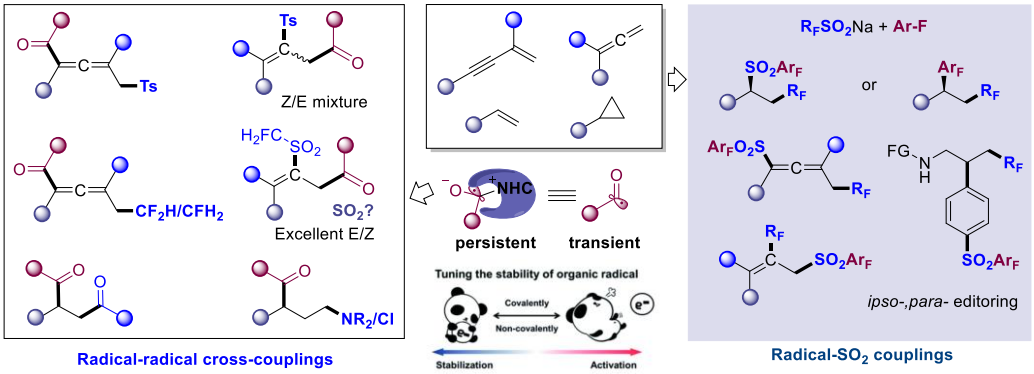
Guangfan Zheng,[a,*] Qian Zhang[a]

[a]*Department of Chemistry, Northeast Normal University, Changchun, China*

e-mail: zhenggf265@nenu.edu.cn

Keywords: Radical Cross-Coupling, *Photocatalysis, Multicomponent Reactions, Di-functionalization, Persistent Radical Effect*

The “persistent radical effect” (PRE) [1] is a kinetic principle that explains the high selectivity often observed in cross-coupling reactions between radical species. This effect arises when two radicals with differing lifetimes are generated at equal rates: the more persistent radical accumulates, while the short-lived species remains at low concentration, leading to preferential cross-coupling. N-Heterocyclic carbenes (NHCs) facilitate the stabilization of acyl radicals, thereby paving the way for controlled radical acylation via radical–radical cross-coupling[2]. Inspired by seminal contributions from Ohmiya, Studer, Chi, and coworkers, we developed a visible-light-mediated dual catalytic system combining NHCs with photoredox catalysts (PCs) to achieve radical acylative difunctionalization of various unsaturated hydrocarbons, including olefins[3b], 1,3-enynes[3c], allenes, and cyclopropanes[3d,e]. Furthermore, by employing CF_2SO_2Na as a bifunctional reagent and harnessing the stabilized SOMO of sulfur dioxide, we accomplished controllable difluoromethylation–polyfluoroarylsulfonylation of unsaturated hydrocarbons[3f], as well as ipso-/para-selective difluoromethylation–polyfluoroarylsulfonylation of aniline derivatives[3g].



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Name：Shifa Zhu （祝诗发）

Affiliation: Zhejiang Sci-Tech University / South China University of Technology

Address: 928 Second Avenue, Xiasha Higher Education Zone, Hangzhou, Zhejiang, China

Email: zhusf@scut.edu.cn

Short biography:

Shifa Zhu received his Bachelor's degree from Hunan University in 2001. He obtained his PhD from the Shanghai Institute of Organic Chemistry (SIOC), Chinese Academy of Sciences, in 2006 under the supervision of Prof. Shizheng Zhu. After two years' postdoctoral training with Prof. X. Peter Zhang from 2007–2008 at the University of South Florida, he returned to China and joined the South China University of Technology (SCUT) in 2009 where he started his independent research. He is currently a professor at Zhejiang Sci-Tech University and South China University of Technology. His current research interests mainly focus on alkyne chemistry.

Catalytic Transformation of Acetylene

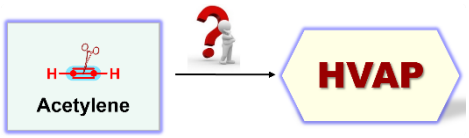
Shifa Zhu[a,b]

[a] *School of Chemistry and Chemical Engineering, Zhejiang Sci-Tech University*
[b] *Key Laboratory of Functional Molecular Engineering of Guangdong Province, School of Chemistry and Chemical Engineering, South China University of Technology*

e-mail: zhusf@zstu.edu.cn, zhusf@scut.edu.cn

Keywords: *Acetylene, Transient Species*

Acetylene is the simplest alkyne, which is one of the most important fundamental coal-based chemical feedstocks. However, research on the transformations of acetylene was mainly conducted before the 1960s. Furthermore, most of the research has focused on the low value-added fine chemicals. Due to the inherent unique structure, easily flammable and explosive properties of the acetylene molecule, there are very limited applicable methods for its transformation in literature. Recently, on the basis of achieving the diversity transformation of substituted alkynes, we turned our attention to the transformation of acetylene, with a focus on developing new catalytic systems suitable for acetylene. Following this interest, three different strategies of metal catalysis, photocatalysis and photoredox/metal dual catalysis has been developed to enable the efficient conversion of acetylene into high value-added chemicals under 1 atm through cleavage of carbon-carbon triple bond of acetylene molecule.[1-12]



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ORAL PRESENTATIONS

Name: Georg Manolikakes

Affiliation: Department of Chemistry RPTU University Kaiserslautern-Landau

Address: Erwin-Schrödinger-Str. 54, D-67663 Kaiserslautern Germany

Email: Georg.manolikakes@chem.rptu.de

Short biography:

Georg Manolikakes studied chemistry at the Ludwig-Maximilians University (LMU) Munich. At the LMU, he joined the group of Prof. Paul Knochel and received his PhD in 2009 in the field of organometallic chemistry. After a postdoctoral stay with Prof. Phil S. Baran at the Scripps Research Institute, he started his independent career at the Goethe-University Frankfurt in 2010. In 2017, he was appointed as an associate professor at the Technical University Kaiserslautern. His research interests cover multicomponent and one-pot reactions, synthetic photo- and electrochemistry, the synthesis of sulfonylcontaining molecules, asymmetric synthesis and medicinal chemistry.

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Modular Synthesis of Sulfonamides and Sulfonates Via Electrochemical Fixation of Sulfur Dioxide

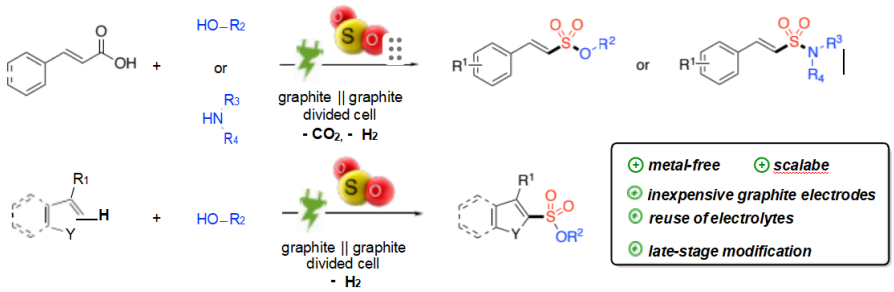
Georg Manolikakes,[a]

[a]*Department of Chemistry, RPTU Kaiserslautern-Landau*

e-mail: Georg.manolikakes@chem.rptu.de

Keywords: *sulfonamides, sulfonates, sulfur dioxide, multicomponent reaction, electrosynthesis*

Molecules containing a sulfonyl (-SO2-) functionality, such as sulfones, sulfonamides or sulfonates, play an important role in organic chemistry and have found widespread application, in particular in medicinal chemistry and material sciences. Therefore, the development of novel methods for a sustainable synthesis of these compounds is of great interest.[1] In the last years, the direct incorporation of sulfur dioxide (SO2) into organic molecules has emerged as versatile tool for a modular synthesis of sulfones and sulfonamides.[2] Furthermore, novel reagent-less activation procedures based on the photochemical or electrochemical fixation of SO2 offer attractive opportunities for more sustainable syntheses of sulfur- containing organic molecules.[3] Herein, novel methods for the synthesis of sulfonates and sulfonamides via electrochemical fixation of sulfur dioxide as key building block are presented. These methods include two three-component reactions for the synthesis of alkyl alkenesulfonates[4] and alkene sulfonamides[5] from cinnamic acids, SO2 and alkyl alcohols or amines in a decarboxylative transformation and a process for the synthesis of heteroaryl sulfonates via selective C(sp^2)-H-functionalization.[6] All methods are metal-free and feature the use of inexpensive graphite electrodes in combination with simple-to-use SO2 stock solutions. The applicability of these processes is demonstrated in scale-up and electrolyte reusability experiments as well as the late-stage modification of drug-like scaffolds.



Graphical Abstract

Overall, these processes enable a highly modular construction of the sulfonyl functionality using sulfur dioxide as key building block using electricity as driving force. Both the direct decarboxylative transformation of cinnamic acids, as bio-based feedstocks and the direct functionalization of C-H-bonds provide intriguing opportunities for a more sustainable synthesis of medicinally relevant scaffolds.

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Name：Dr. Muhammad Idham Darussalam Mardjan.

Affiliation: Department of Chemistry, Universitas Gadjah Mada, Indonesia

Address: Bulaksumur 21, Yogyakarta 55281, Indonesia

Email: idham.darussalam@ugm.ac.id

Short biography :

Dr. Muhammad Idham Darussalam Mardjan is an academic and researcher whose expertise lies in development of one-pot reactions to access bioactive heterocycles bearing nitrogen, oxygen and sulfur atoms. The library of heterocyclic compounds is then subjected to various biological assays, such as antiplasmodium, anticancer, antimicrobial and antidiabetic assays.

He completed his Undergraduate and Master education in Universitas Gadjah Mada, Indonesia, in the field of Organic Chemistry. He then pursued his Doctoral Degree (2013-2016) in Aix-Marseille Université, France, under the supervision of Prof. Laurent Commeiras and Dr. Jean-Luc Parrain. His doctoral thesis focused on the application of multicomponent reactions towards the synthesis of γ-hydroxybutyrolactams, polycyclic lactams, and spirolactams.

He has served as lecturer and researcher at Departement of Chemistry, Universitas Gadjah Mada, Indonesia, since 2014. In 2019-2022, he was a visiting scholar (supported by Fulbright Indonesia) in the laboratory of Prof. Gary Molander, University of Pennsylvania, United States. He continued to contribute to academic advancement as a visiting Scholar in the laboratory of Professor Laurent Commeiras in Aix-Marseille Université, France, in 2024.

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Straightforward Access To Bioactive Quinazolinones Through One-Pot Reaction

Muhammad Idham Darussalam Mardjan,a-Bina Agustin Aulia,a Tendy Oktriawan,a

Nabilla Nurfayza Wanda Putri,a Safira Maulida Ristifarah,a Winarto Haryadi,a

Tutik Dwi Wahyuningsih,a Indriana Kartini,a Edouard Fauran,b and Laurent Commeirasb

A Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Gadjah Mada, Sekip Utara, BLS 21, Yogyakarta 55281, Indonesia b Aix-Marseille Université, Centrale Marseille, CNRS, iSm2 UMR 7313, Campus scientifique de St Jérôme 13397, Marseille, France

e-mail: idham.darussalam@ugm.ac.id

Keywords: quinazolinones, one-pot reaction, multicomponent reaction, antiplasmodium, anticancer

Quinazolinones represent an important class of heterocyclic compounds, known for their broad spectrum of biological activities. The construction of these scaffolds in effective and efficient manner has triggered considerable attention. This study reports a straightforward and general strategy for the synthesis of highly functionalized quinazolinones from readily available starting materials of isatoic anhydrides, primary amines and aldehydes or alcohols. In this context, we manage to employ one-pot reaction (multicomponent and sequential reactions) to create a library of diversely-substituted- quinazolines in good yields. it is also interesting to note that the synthesis of quinazolinones can be carried out in multigram scale. Moreover, the in vitro biological evaluation demonstrates that some derivatives exhibit potent activities against Plasmodium falciparum strains and cancer cell lines with minimal toxicity to the normal cells, making them good candidates for further development as antiplasmodium and anticancer agents.

Name： Maxim A. Mironov

Affiliation: Ural Federal University

Address: Mira str. 19, Ekaterinburg, Russian Federation

Email: m.a.mironov@urfu.ru

Short biography:

Maxim Mironov received his PhD in 1999 and has since participated in scientific and commercial projects related to combinatorial chemistry and biopolymers. He has worked intensively in the field of isocyanide-based multicomponent reactions. In 2009, he organized the MCR2009 conference in Yekaterinburg. In 2014, he accepted a full professorship at Ural Federal University, where his research interests focus on the synthesis of microgels and their practical applications in medicine, the food industry, and household chemicals. To implement his findings, he founded the company Biomicrogels in 2012, which is now successfully operating and developing. He is the author of many patents and scientific articles, and the winner of innovation competitions such as the Best Innovator of Moscow in 2021 and Innocentive.

Multicomponent Reactions With Biopolymers As A Powerful Tool For Preparation Of 3-D Microstructures

Maxim A. Mironov, Yaroslava A. Menzorova, Mushtaq Hussain and Suleiman Bacha

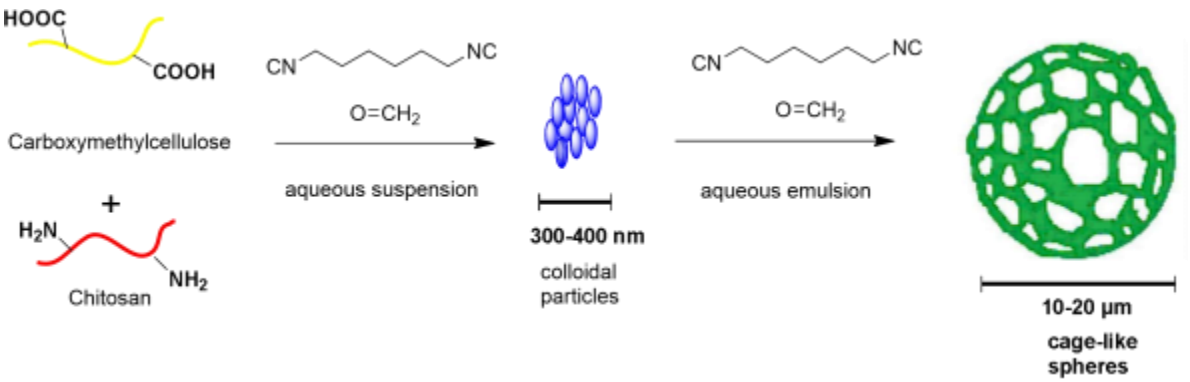
Department of Technology for Organic Synthesis, Ural Federal University

Mira 19, 620002 Ekaterinburg, Russian Federation

e-mail: m.a.mironov@urfu.ru

Keywords: *Ugi, Passerini reactions, Polysaccharides, Colloidosomes, Cage-like microstructures*

Microstructures such as polymer capsules, porous colloidosomes, and cage-like microstructures in the form of spheres, tubes, and petals with sizes of 5–20 μm are of interest as scaffolds for tissue engineering and 3-D bioprinting. Biopolymers are preferable over synthetic polymers for these purposes due to their biocompatibility with human tissues. However, traditional methods for producing 3-D microstructures based on biopolymers are a multi-step and labor-intensive process. Our group makes extensive use of multicomponent chemistry to achieve this in one or at most two steps. As a starting material we used polysaccharides such as: carboxymethyl cellulose, pectin, fucoidan, gum arabic and chitosan [1-4] .



As an example, the figure shows the synthesis of cage-like microspheres based on carboxymethyl cellulose and chitosan. The cage-like structures were obtained in two steps by repeating the Ugi reaction. At the first stage, submicron colloidal particles based on carboxymethylcellulose and chitosan with a domain structure were obtained in an aqueous suspension. In the second stage, the Ugi reaction was carried out on the surface of Pickering emulsions with toluene. Removal of toluene and redissolution in water resulted in the microspheres with large holes on the surface. Varying the reaction conditions during this process made it possible to obtain structures with different porosity. The Ugi reaction in water is an ideal choice because it is characterized by high rates over a narrow pH range. This allows us to control the process of formation of cage-like structures. During the conference we will also present other examples of obtaining 3-D

microstructures using multicomponent reactions. Particular attention will be paid to the study of the mechanism of this process, which occurs at the boundary of two phases under nonequilibrium conditions. The practical use of the materials obtained during our research as carriers of biologically active substances and sorbents will also be demonstrated.

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Name： Yu Qian

Affiliation: School of Pharmaceutical Sciences, Sun Yat-sen University

Address: No. 132, Waihuan East Road, University Town, Guangzhou, China

Email: qianyu5@mail.sysu.edu.cn

Short biography :

Professor Yu Qian received his B.Sc. in 2007 from Dalian University of Technology and his Ph.D. in Organic Chemistry in 2013 under the supervision of Prof. Wen-Hao Hu at East China Normal University. During 2011–2013, he conducted research with Prof. Michael P. Doyle at the University of Maryland. He then worked as a Group Leader at WuXi AppTec (2013–2016). In 2017, he joined the School of Pharmaceutical Sciences, Sun Yat-sen University, as a recipient of Sun Yat-sen University “Hundred Talents Program”, and is also a core member of the Guangdong Zhujiang River Talent Team. His research focuses on the development of novel multicomponent synthetic methodologies and their applications in drug synthesis and medicinal chemistry, with particular emphasis on anti-infective and anticancer drug discovery. By integrating innovative reaction design with biologically oriented synthesis, his work provides efficient strategies for constructing structurally diverse and pharmacologically relevant molecules, facilitating the development of new chemical entities with potential therapeutic applications.

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Multicomponent Reactions with Rh Carbynoids

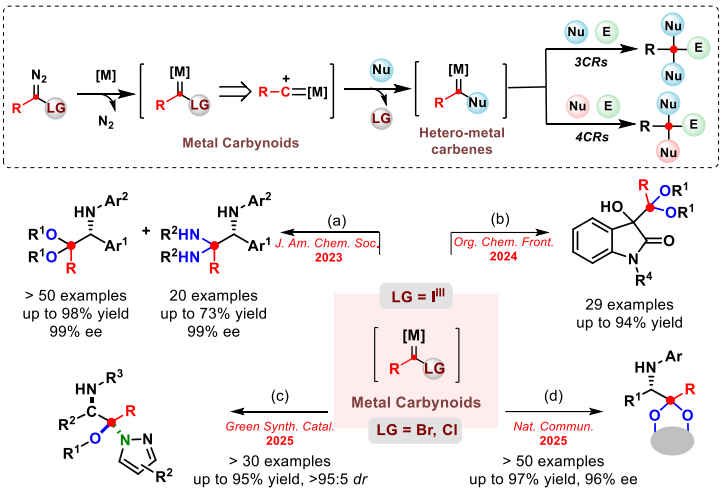
Yu Qian[a] and Wenhao Hu[a]

[a]*School of Pharmaceutical Sciences, Sun Yat-sen University, Guangzhou 510006 (P. R. China)*

e-mail: qianyu5@mail.sysu.edu.cn

Keywords: *Rh Carbynoids; Reactive intermediates; Multicomponent reactions; Asymmetric synthesis*

Multicomponent reactions involving reactive intermediates have become a powerful strategy for constructing structurally diverse and functionally complex molecules. In our research, we have developed a series of diazo compounds bearing leaving groups as precursors for metal Carbynoids, which serve as versatile reactive intermediates. Upon catalytic generation, these metal Carbynoids react with nucleophiles to form Fischer-type heteroatom-substituted metal carbenes, which then undergo a second nucleophilic attack to generate ylides, and are ultimately trapped by electrophiles. By employing cooperative catalysis or precisely controlling the formation rate of heteroatom-substituted metal carbenes, we achieve ordered reaction sequences with high stereochemical fidelity. This approach not only enables the efficient synthesis of structurally complex molecules but also provides a flexible platform for rapid assembly of diverse new chemical entities, which is valuable for drug discovery and functional molecule development.



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Name: Golubenkova Alexandra

Affiliation: Peoples' Friendship University of Russia

Address: Russia, 117198, Moscow, Miklukho-Maklaya str. 6

Email: golubenkova_as@pfur.ru

Short biography:

Alexandra Golubenkova received her master's degree in Organic Chemistry from PhD degree in Organic Chemistry from Peoples' Friendship University of Russia in 2020 and her PhD degree from the same university in 2023. The scientific interests mainly focus on heterocyclic chemistry, domino reactions methodology and new MCR reactions.

A Domino Route From Imidazolines And Electron-Deficient Alkynes To Polysubstituted Pyrroles, Tetrahydropyrrolo[1,2-A]Pyrazines And Pyridines

Golubenkova A.S., Voskressensky L.G.

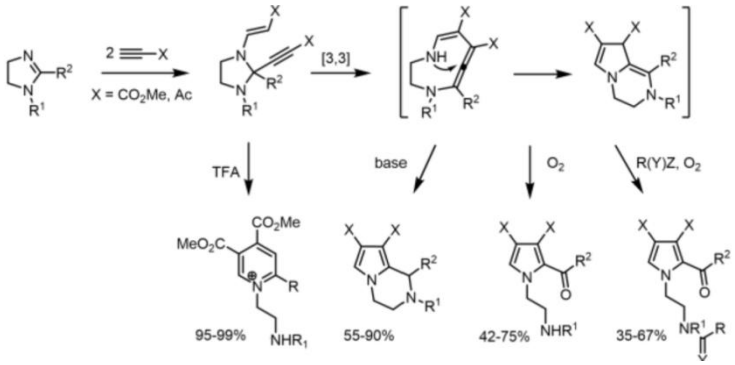
Peoples' Friendship University of Russia, 117198, Moscow, Miklukho-Maklaya str. 6

e-mail: golubenkova_as@pfur.ru

Keywords: *domino reaction, aza-heterocycle, electron-deficient alkynes*

Nitrogen-containing compounds such as 1,2,3,4-tetrahydropyrrolo[1, 2-a]pyrazines, N- substituted pyrroles, and pyridines are an important motifs due to their biological activities. In particular, polysubstituted pyrroles have anti-tumor activity and antibiotics while pyrrolo[1,2-a] pyrazine derivatives show neuropsychotropic properties. Thus, the synthesis of these widely exiting heterocyclic systems still attracts much attention of scientists.

The present work discloses our latest results, concerning three-component reaction of 2-imidazolines and electron-deficient terminal alkynes to form tetrasubstituted imidazolidines, which can undergo further transformations[1-3]. As a convenient starting material, we consider 2-imidazolines which can be easily obtained by new preparative methods discovered in recent times.



Obtained tetrasubstituted imidazolidines have an amino-ester fragment, cyclic aminal fragment and an electron-deficient triple bond, such a concentrated set of reaction centers allows us to expect a high synthetic potential of these compounds. It can be interesting as for investigation a mechanism of the proceeding reactions as for synthesis aimed at expanding molecular diversity.

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Name：Shenghan Teng (滕胜寒)

Affiliation: Fujian Normal University

Address: Room 801, No.18 Science Building, Qishan Campus, 350117

Email: ifeshhteng@fjnu.edu.cn

Short biography:

Prof. Shenghan Teng received his BS and MS degrees in Chemistry from East China Normal University under the guidance of Prof. Wenhao Hu. In 2016, he joined Prof. Jianrong Steve Zhou's group at Nanyang Technological University as a PhD student. After graduation, he carried out postdoctoral research with Prof. Teck-Peng Loh at NTU, working on green organic reactions in water. He joined Fujian Normal University in 2023 and was promoted to professor in December 2024. His research interests include asymmetric synthesis and organoboron chemistry.

Modular Synthesis Of Luminescent Boron-Containing Heterocycles From B-Alkynones Trifluoroborates, Amines And Arynes

Shenghan Teng[a]*, Lin Hu[a] and Peiyao Liang[a]

[a]Strait Institute of Flexible Electronics (SIFE, Future Technologies), Fujian Key Laboratory of Flexible Electronics, Fujian Normal University and Strait Laboratory of Flexible Electronics (SLoFE), Fuzhou 350117,China

e-mail: ifeshhteng@fjnu.edu.cn

Keywords: *alkynes, aminoarylation, boron-containing heterocycles, one-pot methodologies, geometric selectivities, tunable emission*

Abstract: Selective aminoarylation of internal alkynes under transition metal-free conditions provides a sustainable route to fully substituted enamines that are useful in pharmaceuticals and organic electronics[2] . Incorporation of tetracoordinated boron further modulates photophysical properties, paving the way for advanced optoelectronic materials[3] . Yet existing aminoarylation strategies rely on ambiphilic reagents with limited functional-group compatibility and are inapplicable to boryl alkynes[4] . Recent work by Loh and coworkers revealed that benchtop-stable alkynone ß -trifluoroborates react with diverse amines under physiological conditions to deliver stable oxaboracycles by forming covalent B–O bond[5] . Building on this amine-specific boron chemistry[6], we report a streamlined intermolecular aminoarylation of alkynone ß -trifluoroborates with amines and arynes via a sequential amine-click/aryne trapping process, affording *E*-selective oxaboracycles with high regio- and stereoselectivity under mild conditions[7] . Incorporation of tetracoordinated boron centers and aryl “rotors” not only induces aggregation-induced emission enhancement (AIEE) but also enables wavelength-tunable solid-state emission from violet to red. The resulting oxaboracyclic tetrasubstituted enaminones exhibit key advantages as functional luminophores for biological applications, including large Stokes shifts, outstanding chemical and photostability, low cytotoxicity and excellent biocompatibility. Their potential utility is demonstrated by reliable performance as fluorescent probes for live-cell imaging.

Figure 1. Streamlined synthesis of oxaboracyclic tetrasubstituted enaminones via sequential amine-

click/arylation process

See MCR2026 website for more details: https://sps.sysu.edu.cn/mcr2026/

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Name: Chunan Wang

Affiliation: School of Pharmaceutical Sciences, Sun Yat-sen University, Guangzhou, Guangdong 510006, China;

Address: School of Pharmacy, Sun Yat-sen University, Outer Ring East Road, Panyu District, Guangzhou, Guangdong

Email: 18327140270@163.com

Chemo-, Regio- andStereoselective Modification of Sugars via a Multicomponen Reaction

Chunan Wang[a]

[a]: School of Pharmaceutical Sciences, Sun Yat-sen University. Guangzhou, Guangdong 510006, China;

e-mail: 18327140270@163.com

Keywords: Multicomponent Reaction*, Glycoconjugate*

To tackle the selectivity challenge head-on[1], we devised a novel and streamlined catalytic strategy. Our core design is: “Metal-Carbene → Sugar Oxonium Ylide → Electrophile Trapping.”

Here’s how it works: We leverage the intrinsic chemoselectivity of a Rh(II)-carbene, generated in situ, for a specific hydroxyl group on the free sugar. This forms a key sugar oxonium ylide intermediate. To control the critical stereochemistry of the next step, we introduced a Chiral Phosphoric Acid as a co-catalyst. This creates a synergistic Rh(II)/CPA catalytic system. The CPA precisely regulates the chiral environment of the ylide-imine addition, enabling the direct, stereocontrolled synthesis of chiral sugar-amino acid conjugates in one pot. This is a powerful convergence of carbohydrate chemistry and multicomponent reaction design[2].

With optimal conditions in hand, we explored the generality of this transformation. The reaction demonstrates excellent tolerance and broad scope. A wide range of commercially available sugars—including hexoses, pentoses, and disaccharides—reacted smoothly. On the amino acid side, various α-aryl and α-alkyl glycine esters derived from aldehydes and isocyanides were all compatible. In all cases, the reaction proceeded with complete chemoselectivity for a single OH group, high regioselectivity, and most importantly[3], outstanding diastereoselectivity (>20:1 dr), providing a diverse library of novel glycoconjugates.

In summary, we have developed a synergistic Rh(II)/CPA catalyzed, multicomponent reaction that achieves direct, chemo-, regio-, and stereoselective glycosylation. It provides rapid access to valuable chiral sugar-amino acid hybrids from simple starting materials.Looking forward, we are investigating the biological activity of these novel conjugates, exploring the extension of this ylide chemistry to other nucleophilic biomolecules, and further optimizing our continuous flow system for industrial relevance.

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Name：Minghui Wu

Affiliation: Maastricht University

Address: Urmonderbaan 22, 6167 RD, Geleen, The Netherlands

Email: wu.minghui@maastrichtuniversity.nl

Short biography:

Minghui Wu was born and raised in Sichuan, China. She finished her bachelor in Polymer science and engineering at Changzhou University in 2020. After that, she receivedThe Dutch Orange Tulip Scholarshipfor the masterand has gainedthe master's degree of Biobased Materials at Maastricht University in 2022. Since 2022, she has started the PhD journey under the supervision of Prof. Romano Orru, mainly focusing on isocyanide chemistry and photocatalysis. Till now, she has completed two projects and published them in Chemical Science and The Journal of Organic Chemistry.

Non-Innocent Behaviour Of Aromatic Isocyanides Under Visible Light: A Pathway To Thioformimidates And Dehydroalanine

Minghui Wu,[a] Jay Hanssen,[a] Camilla Russo,[b] Rajat Walia,[c] Mariateresa Giustiniano,[b,] Ludovic Troian-Gautier,[d] Jordy M. Saya,[a] Romano Orru,[a,*] Prabhat Ranjan [a,d,*]

[a]*Biobased Organic Chemistry, Aachen-Maastricht Institute for Biobased Materials (AMIBM), Maastricht University, Urmonderbaan 22, 6167RD Geleen, the Netherlands.*

[b]*Department of Pharmacy, University of Naples Federico II, Via D. Montesano 49, 80131 Napoli, Italy.*

[c]*Walia Institute of Functional Nano and Soft Materials (FUNSOM), Joint International Research Laboratory of Carbon-Based Functional Materials and Devices, Soochow University, Suzhou, People's Republic of China.*

[d]*UCLouvain, Institut de la Matière Condensée et des Nanosciences (IMCN), Molecular Chemistry, Materials and Catalysis (MOST), Place Louis Pasteur 1/L4.01.02, B-1348 Louvain-la-Neuve, Belgium.*

e-mail: wu.minghui@maastrichtuniversity.nl

Keywords: *Photochemistry, Visible light, Isocyanide cascade, Dehydroalanine (DHA) derivatives*

Thioformimidates play an important role in peptide modifications as the protection group[1]. The most common method for the synthesis of thioformimidates involves *S*-alkylation of thioformamides with aryl or alkyl halides. However, these processes often suffer from several limitations and purification problems due to the instability of thioformamides and limited substrate scope. Alternatively, thioformimidates can also be synthesized from isocyanides and thiols triggered by UV-light or AIBN initiator [2]. Generally, this reaction proceeds with the formation of a thiyl radical in the presence of UV- light or AIBN followed by thiyl radical addition on the isocyanide to generate an α-thioimidoyl radical [3]. This radical can then undergo H-abstraction from thiols to form the final thioformimidates product. Despite the convenience of this method, less attention has been directed to this pathway due to the following reasons: a) the requirement of UV-light; b) poor reaction efficiency; c) the formation of unwanted side products such as 1,1-bisthiolation; d) C-S bond scission of the intermediate α-thioimidoyl radical, leading to the generation of isothiocyanates.

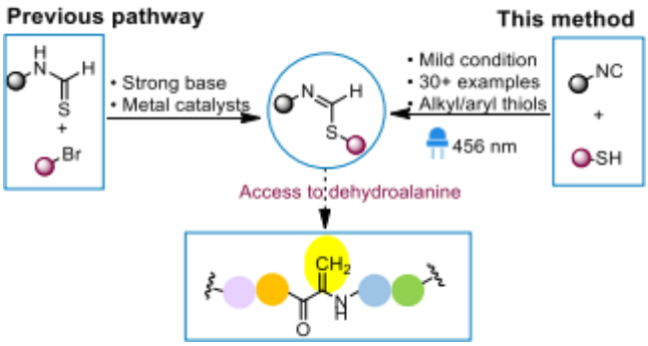

Figure 1. Visible light-mediated synthesis of thioformimidates and application to *dehydroalanine (DHA) derivatives*

Previously, we desighed a photocatalyst-free pathwy to spirocyclic scaffolds from tryptamine- derived isocyanides by employing blue light [4]. Given the significance of thioformimidates and the current limitations in versatile, sustainable synthetic methods, we focused on developing an innovative, photocatalyst-free, visible-light-driven approach for their synthesis. This study marks a significant advance in the field, as it not only improves existing methods for accessing thioformimidates but also reveals a previously camouflaged role of isocyanides in generation of thiyl radicals.

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Name：Dong Xing

Affiliation: East China Normal University

Address: 3663 North Zhongshan Road, Shanghai, China, 200062

Email: dxing@sat.ecnu.edu.cn

Short biography:

Dong Xing received his B.S. and M.S. degree from East ¬China Normal University, and his Ph.D. degree from the University of Hong Kong with Professor Dan Yang in 2011. He then joined the School of Chemistry and Chemical ¬Engineering at East China ¬Normal University. In 2016, he began his postdoctoral research with Professor Guangbin Dong at the University of Texas at Austin and then moved to the University of Chicago with the Dong laboratory. In 2018, he returned to East China Normal University, where he is currently a professor of Chemistry. His research interests include synthetic methodology and medicinal chemistry.

Asymmetric Three-Component Difunctionalization of Alkenes via Radical Relay

Dong Xing,[a] Shang Wang[a] and Zhiheng Li[a]

[a]*School of Chemistry and Molecular Engineering, East China Normal University, Shanghai, China*

e-mail: dxing@sat.ecnu.edu.cn

Keywords: *asymmetric, radical relay, difunctionalization, alkene, aldehyde, alkane*

The use of feedstocks as atom-economic radical precursors for related three-component difunctionalization of alkenes in asymmetric synthesis is of particular interest in radical chemistry. In this talk, we present our recent progress on the use of simple aldehydes or alkanes as corresponding acyl or alkyl radical precursors for copper-catalyzed asymmetric acylative or alkylative difunctionalization of styrenes for the synthesis of diverse chiral molecules. Such process relies on the use of organic peroxide as hydrogen-atom-transfer (HAT) reagent to efficiently convert aldehyde or alkane into their corresponding radicals, which then undergo radical addition to the styrene moiety via radical relay to generate the corresponding benzylic radical. The third component such as arylboronic acid or TMSCN was then introduced while efficient stereocontrol was achieved by the copper catalyst at this stage.

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Name：Zhongqiu Xing

Affiliation: Nanjing University (Graduate Students)

Address: School of Chemistry and Chemical Engineering

Email: 602022240142@smail.nju.edu.cn

Short biography :

Xing Zhongqiu was born and raised in Anhui, China. Now he is a Ph.D. candidate in Chemical Biology at Nanjing University, where he conducts interdisciplinary research at the intersection of synthetic biology and synthetic chemistry under the supervision of Researcher Huang Xiaoqiang. He is the first author of a Nature paper titled "Synergistic photobiocatalysis for enantioselective triple radical sorting." His work in the Huang Group contributes to the team's broader research portfolio—spanning biocatalysis, asymmetric photoelectrochemistry, artificial enzymes, and engineered microbial factories—which has been published in leading journals such asNature, Nature Catalysis, JACS, and Angewandte Chemie.

Synergistic photobiocatalysis for enantioselective triple radical sorting

Zhongqiu Xing[1], Fulu Liu[1], Jiangiang Feng[1], Binju Wang[2*], Xiaoqiang Huang[1*]
1
School of Chemistry and Chemical Engineering, Nanjing University, Nanjing 210023, China 2
College of Chemistry and Chemical Engineering, Xiamen University, Xiamen 361005, China
*Contact email: 602022240142@smail.nju.edu.cn

Harnessing enzymes for non-natural asymmetric transformations, which are challenging for traditional chemocatalysis, holds great significance[1-3]. Despite the notable benefit of multicomponent reactions in broadening chemical space and enhancing molecular complexity[4], achieving enzymatic conversion of three variable substrates into enantioenriched compounds via a single reaction has remained rare.[5] This limitation primarily arises because an enzyme's active site cannot concurrently tame multiple substrates or intermediates, especially in cases involving multiple radical intermediates[6]. Recently, chemocatalytic radical sorting has emerged as an enabling strategy for a variety of appealing reactions[7,8]. However, directing such processes in an enantioselective manner is highly challenging due to the inherent difficulty in the stereocontrol of radicals[9]. Herein, we repurpose a thiamine-dependent enzyme[10,11] through directed evolution and synergy with photoredox catalysis, to facilitate an unprecedented photobiocatalytic enantioselective three- component radical cross-coupling. Mechanistic investigations have provided crucial insights into how this dual photo-/enzyme system precisely directs the three distinct radicals involved in the transformation, unlocking new enzyme reactivity and enabling access to a variety of enantioenriched carbonyl compounds. Our approach has achieved exceptional stereoselectivity, with 25 out of 33 examples achieving ≥97% enantiomeric excess. This work not only expands the repertoire of biocatalysis but also provides a unique strategy for sorting multiple radicals complementing existing chemical tools.

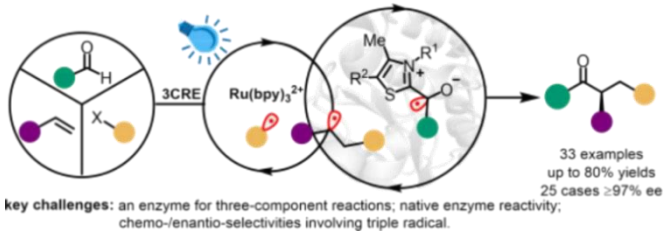

Figure Artificial metalloenzymes result from anchoring an organometallic catalyst within a protein scaffold. The resulting hybrid catalyst can be optimized by combining both chemical and genetic strategies.

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Chiral stational pahses for NP, SFC, PO mode		
Product Name	Stational phase	Similar products
Chiral ND(2)	Amylose tris(3,5-dimethylphenylcarbamate)	Chiralpak AD-H
Chiral NY(2)	Amylose tris(5-chloro-2-methylphenylcarbamate)	Chiralpak AY-H
Chiral NS(2)	Amylose tris((s)-α-methylbenzylcarbamate)	Chiralpak AS-H
Chiral NZ(2)	Amylose tris(3-chloro-4-methylphenylcarbamate)	
Chiral NX(2)	Amylose tris(4-chloro-3-methylphenylcarbamate)	
Chiral NQ(2)	Amylose tris(halogenated-methylphenylcarbamate)	
Chiral NT(2)	Amylose tris(3-chlorophenylcarbamate)	
Chiral MD(2)	Cellulose tris(3,5-dimethylphenylcarbamate)	Chiralcel OD-H
Chiral MZ(2)	Cellulose tris(3-chloro-4-methylphenylcarbamate)	Chiralcel OZ-H
Chiral MJ(2)	Cellulose tris(4-methylbenzoate)	Chiralcel OJ-H
Chiral MX(2)	Cellulose tris(4-chloro-3-methylphenylcarbamate)	Chiralcel OX-H
Chiral MQ(2)	Cellulose tris(halogenated-methylphenylcarbamate)	
Chiral MB(2)	Cellulose tribenzoate	Chiralcel OB
Chiral MC(2)	Cellulose tris(phenylcarbamate)	Chiralcel OC
Chiral MK(2)	Cellulose tricinnamate	Chiralcel OK
Chiral MF(2)	Cellulose tris(4-chloro-phenylcarbamate)	Chiralcel OF
Chiral MG(2)	Cellulose tris(4-methylphenylcarbamate)	Chiralcel OG
Chiral MS(2)	Cellulose tris((s)-α-methylbenzylcarbamate)	
Chiral NC(2)	Amylose tris(phenylcarbamate)	
Chiral MY(2)	Cellulose tris(5-chloro-2-methylphenylcarbamate)	
Chiral NJ(2)	Amylose tris(4-methylbenzoate)	

Chiral stational pahses for RP mode		
Chiral ND(2)-RH	Amylose tris(3,5-dimethylphenylcarbamate)	Chiralpak AD-RH
Chiral NY(2)-RH	Amylose tris(5-chloro-2-methylphenylcarbamate)	Chiralpak AY-RH
Chiral NS(2)-RH	Amylose tris((s)-α-methylbenzylcarbamate)	Chiralpak AS-RH
Chiral NZ(2)-RH	Amylose tris(3-chloro-4-methylphenylcarbamate)	
Chiral NX(2)-RH	Amylose tris(4-chloro-3-methylphenylcarbamate)	
Chiral NQ(2)-RH	Amylose tris(halogenated-methylphenylcarbamate)	
Chiral NT(2)-RH	Amylose tris(3-chlorophenylcarbamate)	
Chiral MD(2)-RH	Cellulose tris(3,5-dimethylphenylcarbamate)	Chiralcel OD-RH
Chiral MZ(2)-RH	Cellulose tris(3-chloro-4-methylphenylcarbamate)	Chiralcel OZ-RH
Chiral MJ(2)-RH	Cellulose tris(4-methylbenzoate)	Chiralcel OJ-RH
Chiral MX(2)-RH	Cellulose tris(4-chloro-3-methylphenylcarbamate)	Chiralcel OX-RH
Chiral MQ(2)-RH	Cellulose tris(halogenated-methylphenylcarbamate)	
Chiral MS(2)-RH	Cellulose tris((s)-α-methylbenzylcarbamate)	
Chiral MY(2)-RH	Cellulose tris(5-chloro-2-methylphenylcarbamate)	
Chiral NJ(2)-RH	Amylose tris(4-methylbenzoate)	
Chiral NC(2)-RH	Amylose tris(phenylcarbamate)	

Chiral stational pahses for NP, SFC, PO and RP mode		
Chiral INA	Amylose tris(3,5-dimethylphenylcarbamate)immobilized	Chiralpak IA
Chiral INB	Cellulose tris(3,5-dimethylphenylcarbamate)immobilized	Chiralpak IB-N, IB
Chiral INC	Cellulose tris(3,5-dichlorolphenylcarbamate)immobilized	Chiralpak IC
Chiral IND	Amylose tris(3,5-dimethylphenylcarbamate)immobilized	Chiralpak ID
Chiral INE	Amylose tris(3,5-dimethylphenylcarbamate)immobilized	Chiralpak IE
Chiral INF	Amylose tris(3-chloro-4-methylphenylcarbamate)immobilized	Chiralpak IF
Chiral ING	Amylose tris(3-chloro-5-methylphenylcarbamate)immobilized	Chiralpak IG
Chiral INH	Amylose tris((s)-α-methylbenzylcarbamate)immobilized	Chiralpak IH
Chiral INK	Cellulose tris(3-chloro-5-methylphenylcarbamate)immobilized	Chiralpak IJ
Chiral INJ	Cellulose tris(4-methylbenzoate)immobilized	Chiralpak IK
Chiral INM	Cellulose tris(3-chloro-4-methylphenylcarbamate) immobilized	Chiralpak IM
Chiral INN	Amylose tris(5-chloro-2-methylphenylcarbamate) immobilized	Chiralpak IN
Chiral INO	Cellulose tris(4-chloro-3-methylphenylcarbamate) immobilized	

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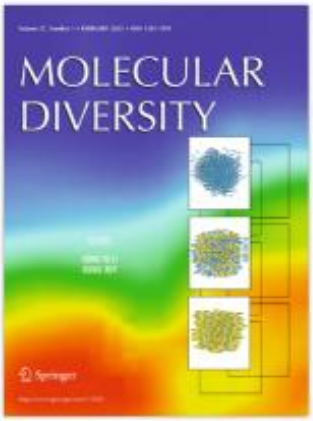
林老师（Miss Lin）13600009327　邮箱（E-mail）：pukangfund@163.com

Molecular Diversity



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