Open Access Article. Published on 31 May 2023. Downloaded on 1/23/2026 12:07:12 AM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

Chemical Science

rsc.li/chemical-science

The Royal Society of Chemistry is the world's leading chemistry community. Through our high impact journals and publications we connect the world with the chemical sciences and invest the profits back into the chemistry community.

IN THIS ISSUE

ISSN 2041-6539 CODEN CSHCBM 14(21) 5531–5812 (2023)

Cover
See Selvan Demir *et al.*, pp. 5577–5592.
Image reproduced by permission of Selvan Demir from *Chem. Sci.*, 2023, **14**, 5577.

Inside cover
See Jatish Kumar *et al.*, pp. 5593–5601.
Image reproduced by permission of Jatish Kumar from *Chem. Sci.*, 2023, **14**, 5593.

COMMENTARY

5542

A focus on aromaticity: fuzzier than ever before?

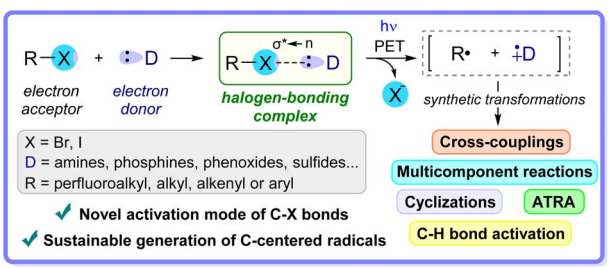
Henrik Ottosson

REVIEW

5545

Shining light on halogen-bonding complexes: a catalyst-free activation mode of carbon–halogen bonds for the generation of carbon-centered radicals

Helena F. Piedra, Carlos Valdés and Manuel Plaza*



Open Access Article. Published on 31 May 2023. Downloaded on 1/23/2026 12:07:12 AM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

Editorial Staff

Executive Editor
May Copsey

Deputy Editor
Samantha Apps

Senior Editor
James Moore

Scientific Editors
Ellis Crawford, Jingtao Huang, Esther Johnston, Sophie Orchard, Richard Thompson and Amy Welch

Editorial Assistant
Karina Webster

Publishing Assistant
David Bishop

For queries about submitted articles please contact James Moore, Senior Editor, in the first instance. E-mail **chemicalscience@rsc.org**

For pre-submission queries please contact May Copsey, Executive Editor.
E-mail **chemicalscience-rsc@rsc.org**

Chemical Science (electronic: ISSN 2041-6539) is published 48 times a year by the Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK.

Chemical Science is a Gold Open Access journal and all articles from 2015 onwards are free to read.
Please email orders@rsc.org to register your interest or contact Royal Society of Chemistry Order Department, Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK

Tel +44 (0)1223 432398; E-mail **orders@rsc.org**

Whilst this material has been produced with all due care, the Royal Society of Chemistry cannot be held responsible or liable for its accuracy and completeness, nor for any consequences arising from any errors or the use of the information contained in this publication. The publication of advertisements does not constitute any endorsement by the Royal Society of Chemistry or Authors of any products advertised. The views and opinions advanced by contributors do not necessarily reflect those of the Royal Society of Chemistry which shall not be liable for any resulting loss or damage arising as a result of reliance upon this material. The Royal Society of Chemistry is a charity, registered in England and Wales, Number 207890, and a company incorporated in England by Royal Charter (Registered No. RC000524), registered office: Burlington House, Piccadilly, London W1J 0BA, UK, Telephone: +44 (0) 207 4378 6556.

Advertisement sales:
Tel +44 (0) 1223 432246; Fax +44 (0) 1223 426017;
E-mail **advertising@rsc.org**

For marketing opportunities relating to this journal, contact **marketing@rsc.org**

Chemical Science

rsc.li/chemical-science

Editorial Board

Editor-in-Chief
Andrew Cooper, University of Liverpool

Associate Editors
Vincent Artero, CEA-Grenoble
Luis M. Campos, Columbia University
Michelle Chang, University of California, Berkeley
Lin X. Chen, Northwestern University
Graeme Day, University of Southampton
Serena DeBeer, Max Planck Institute for Chemical Energy Conversion
Mircea Dincă, MIT
Vy Dong, University of California, Irvine
François Gabbaï, Texas A&M University
Subi George, JNCASR
Jinlong Gong, Tianjin University
Stephen Goldup, University of Birmingham
Zaiping Guo, University of Adelaide
Christopher A. Hunter, University of Cambridge
Malika Jefferies-EL, Boston University
Ning Jiao, Peking University
Tanja Junkers, Monash University
Hemamala Karunadasa, Stanford University
Maja Köhn, University of Freiburg
Yi-Tao Long, Nanjing University
Gabriel Merino, CINVESTAV Merida
James K. McCusker, Michigan State University
Thomas Meade, Northwestern University
Paolo Melchiorre, University of Bologna
Carsten Schultz, Oregon Health & Science University
Dmitri Talapin, The University of Chicago
Toshiharu Teranishi, Kyoto University
Andrei Yudin, University of Toronto

Advisory Board

Dave Adams, University of Glasgow
Ayyappanpillai Ajayaghosh, NIIST
Ulf-Peter Apfel, Ruhr-University Bochum
Polly Arnold, University of California, Berkeley
Xinhe Bao, Dalian Institute of Chemical Physics
Zhenan Bao, Stanford University
Gonçalo Bernardes, University of Cambridge
Frank Biedermann, Karlsruhe Institute of Technology
Donna Blackmond, Scripps Research Institute
Jeffrey Bode, ETH Zurich
Jennifer S. Brodbelt, University of Texas at Austin, USA
Christopher Chang, University of California, Berkeley
Chi-Ming Che, University of Hong Kong
Jun Chen, Nankai University
R. Graham Cooks, Purdue University
Christophe Copéret, ETH Zurich
Eugenio Coronado, University of Valencia
Leroy Cronin, University of Glasgow
James Crowley, University of Otago
Christopher C. Cummins, Massachusetts Institute of Technology
Ben Davis, University of Oxford
Jillian Dempsey, University of North Carolina at Chapel Hill
Kazunari Domen, University of Tokyo
James Durrant, Imperial College London
Xinlang Feng, TU Dresden
Ben Feringa, University of Groningen
Makoto Fujita, University of Tokyo
Phillip Gale, University of Technology Sydney
Song Gao, Peking University
Jeremiah Gassensmith, University of Texas at Dalls
Elizabeth Gibson, Newcastle University
Ryan Gilmour, WWU Münster
Hubert Girault, EPFL
Frank Glorius, WWU Münster
Leticia González, University of Vienna
Duncan Graham, University of Strathclyde
Vicki Grassian, University of California, San Diego
Alexis Grimaud, Boston College
Christian Hackenberger, FMP Berlin
Buxing Han, Chinese Academy of Sciences
Christy Haynes, University of Minnesota
Patrick Holland, Yale University
Kim Jelfs, Imperial College London
Yousung Jung, KAIST
Stephanie Kath-Schorr, University of Cologne
Takashi Kato, University of Tokyo
Christopher Kelly, Janssen Research & Development
Jérôme Lacour, University of Geneva
Ai-Lan Lee, Heriot-Watt University
Daniele Leonori, RWTH Aachen University
Chao-Jun Li, McGill University
Yi Li, Jilin University
Mi Hee Lim, KAIST
Wenbin Lin, University of Chicago
Kopin Liu, Academia Sinica
Watson Loh, UNICAMP
Bettina Lotsch, Max Planck Institute
Xiong Wen (David) Lou, Nanyang Technological University
Kazuhiko Maeda, Tokyo Institute of Technology
Satoshi Maeda, Hokkaido University
Swadhin Mandal, IISER Kolkata
Ellen Matson, University of Rochester
Scott Miller, Yale University
Daniel Mindiola, University of Pennsylvania
Wonwoo Nam, Ewha Womans University
Jonathan Nitschke, University of Cambridge
Allie Obermeyer, Columbia University
Martin Oestreich, Technical University of Berlin
Takashi Ooi, Nagoya University
Rachel O'Reilly, University of Birmingham
Oleg Ozerov, Texas A&M University
Xiulian Pan, Dalian Institute of Chemical Physics
Nicolas Plumeré, Technical University of Munich
Rasmita Raval, University of Liverpool
Erwin Reisner, University of Cambridge
Andrea Rentmeister, WWU Münster
Jeffrey Rinehart, University of California, San Diego
Stuart Rowan, University of Chicago
Richmond Sarpong, University of California, Berkeley
Danielle Schultz, Merck
Dwight Seferos, University of Toronto
Oliver Seitz, Humboldt University of Berlin
Roberta Sessoli, University of Florence
Kay Severin, Federal Polytechnic School of Lausanne
Mikiko Sodeoka, RIKEN
Galo Soler-Illia, Universidad Nacional de San Martin
David Spring, University of Cambridge
Brian Stoltz, California Institute of Technology
Brent Sumerlin, University of Florida
Raghavan B. Sunoj, IIT Bombay
Yogesh Surendranath, MIT
Mizuki Tada, Nagoya University
Ben Zhong Tang, The Hong Kong University of Science and Technology
Zhiyong Tang, National Center for Nanoscience and Nanotechnology
Christine Thomas, Ohio State University
He Tian, East China University of Science & Technology
Zhong-Qun Tian, Xiamen University
F. Dean Toste, University of California, Berkley
Takashi Uemura, University of Tokyo
Jan van Hest, Radboud University
Latha Venkataraman, Columbia University
Chu Wang, Peking University
Julia Weinstein, University of Sheffield
Tom Welton, Imperial College London
Charlotte Williams, University of Oxford
Vivian Yam, University of Hong Kong
Qi-Lin Zhou, Nankai University
Jenny Zhang, University of Cambridge

Information for Authors

Full details on how to submit material for publication in Chemical Science are given in the Instructions for Authors (available from http://**www.rsc.org/authors**). Submissions should be made via the journal's homepage: **rsc.li/chemical-science**

Authors may reproduce/republish portions of their published contribution without seeking permission from the Royal Society of Chemistry, provided that any such republication is accompanied by an acknowledgement in the form: (Original Citation)–Reproduced by permission of the Royal Society of Chemistry.

This journal is © The Royal Society of Chemistry 2023.
Apart from fair dealing for the purposes of research or private study for non-commercial purposes, or criticism or review, as permitted under the Copyright, Designs and Patents Act 1988 and the Copyright and Related Rights Regulation 2003, this publication may only be reproduced, stored or transmitted, in any form or by any means, with the prior permission in writing of the Publishers or in the case of reprographic reproduction in accordance with the terms of licences issued by the Copyright Licensing Agency in the UK. US copyright law is applicable to users in the USA.

Registered charity number: 207890

ROYAL SOCIETY OF CHEMISTRY

Open Access Article. Published on 31 May 2023. Downloaded on 1/23/2026 12:07:12 AM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

PERSPECTIVE

5569

Aromaticity: Quo Vadis

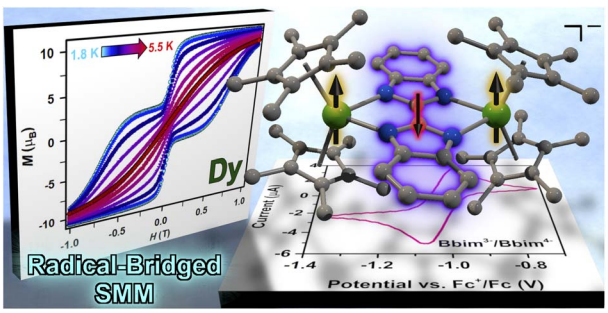
Gabriel Merino,* Miquel Solà,* Israel Fernández,* Cina Foroutan-Nejad,* Paolo Lazzeretti,* Gernot Frenking,* Harry L. Anderson, Dage Sundholm, Fernando P. Cossío, Marina A. Petrukhina, Jishan Wu, Judy I. Wu and Albeiro Restrepo

EDGE ARTICLES

5577

Magnetic hysteresis and large coercivity in bisbenzimidazole radical-bridged dilanthanide complexes

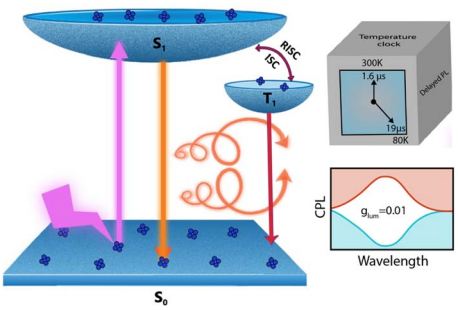
Florian Benner, Léo La Droitte, Olivier Cador, Boris Le Guennic and Selvan Demir*



5593

Delayed luminescence guided enhanced circularly polarized emission in atomically precise copper nanoclusters

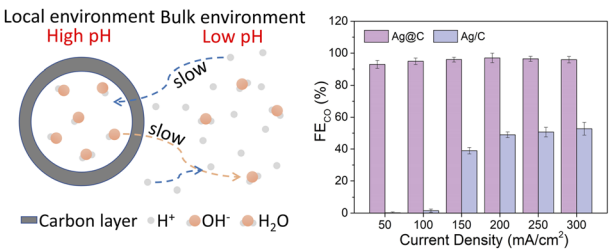
Camelia Dutta, Sonia Maniappan and Jatish Kumar*



5602

Confinement of an alkaline environment for electrocatalytic CO_2 reduction in acidic electrolytes

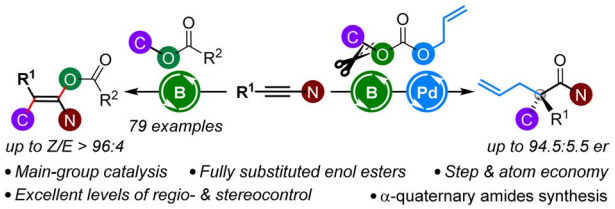
Xiaozhi Li, Peng Zhang, Lili Zhang, Gong Zhang, Hui Gao, Zifan Pang, Jia Yu, Chunlei Pei, Tuo Wang and Jinlong Gong*



Open Access Article. Published on 31 May 2023. Downloaded on 1/23/2026 12:07:12 AM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

EDGE ARTICLES

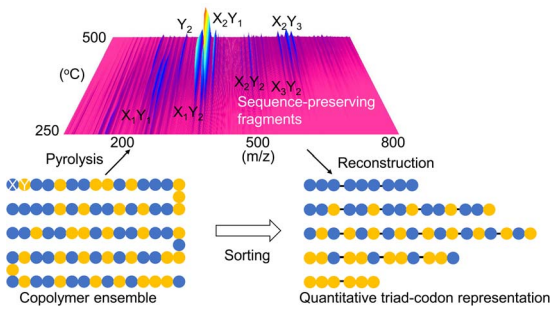
5608



Atom-economic and stereoselective catalytic synthesis of fully substituted enol esters/carbonates of amides in acyclic systems enabled by boron Lewis acid catalysis

Yuanjiu Xiao, Lei Tang, Tong-Tong Xu, Jiang-Yi-Hui Sheng, Zhongyan Zhou, Lei Yue, Guoqiang Wang,* Martin Oestreich* and Jian-Jun Feng*

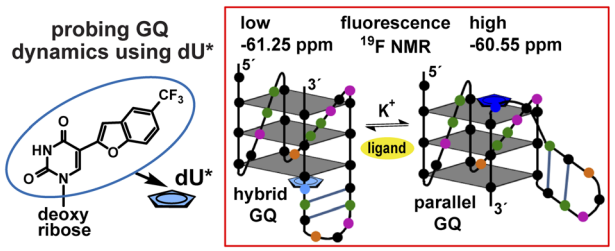
5619



A data-driven sequencer that unveils latent "codons" in synthetic copolymers

Yusuke Hibi,* Shiho Uesaka and Masanobu Naito*

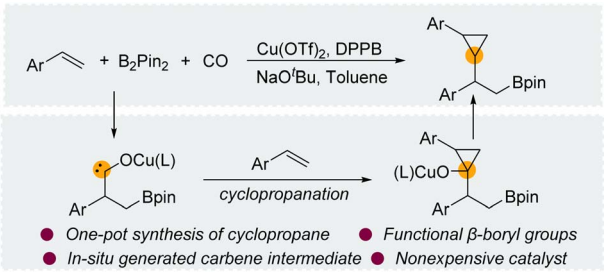
5627



Probing juxtaposed G-quadruplex and hairpin motifs using a responsive nucleoside probe: a unique scaffold for chemotherapy

Saddam Y. Khatik, Sruthi Sudhakar, Satyajit Mishra, Jeet Kalia, P. I. Pradeepkumar and Seergazhi G. Srivatsan*

5638



Copper-catalyzed synthesis of β-boryl cyclopropanes *via* 1,2-borocyclopropanation of aryl olefins with CO as the C1 source

Hui-Qing Geng and Xiao-Feng Wu*

This journal is © The Royal Society of Chemistry 2023

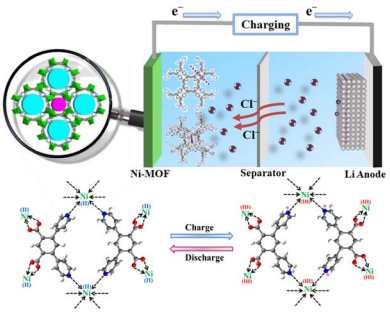
Open Access Article. Published on 31 May 2023. Downloaded on 1/23/2026 12:07:12 AM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

EDGE ARTICLES

5643

A nickel-based metal–organic framework as a new cathode for chloride ion batteries with superior cycling stability

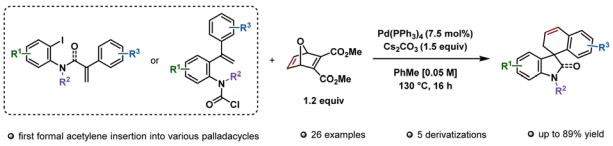
Qing Yin, Zhihao Song, Shuhan Yang, Gang-Ding Wang, Yanwei Sui,* Jiqiu Qi, Danyang Zhao, Lei Hou* and Yong-Zhi Li*



5650

Synthesis of spirooxindoles *via* formal acetylene insertion into a common palladacycle intermediate

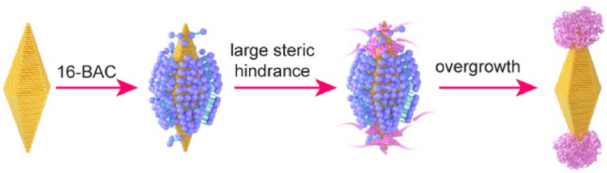
Xavier Abel-Snape, Colton E. Johnson, Bianca Imbriaco and Mark Lautens*



5656

Steric hindrance-induced selective growth of rhodium on gold nanobipyramids for plasmon-enhanced nitrogen fixation

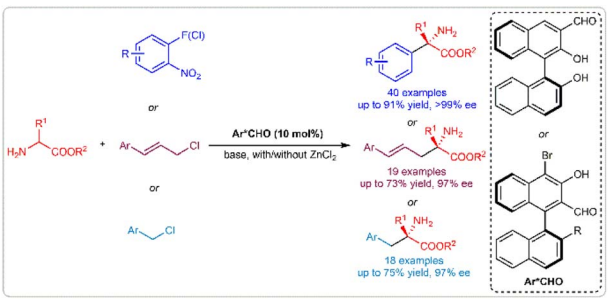
Henglei Jia, Fan Li, Yuanyuan Yang, Mengxuan Zhao, Jingzhao Li and Chun-yang Zhang*



5665

Chiral aldehyde catalysis enables direct asymmetric α-substitution reaction of N-unprotected amino acids with halohydrocarbons

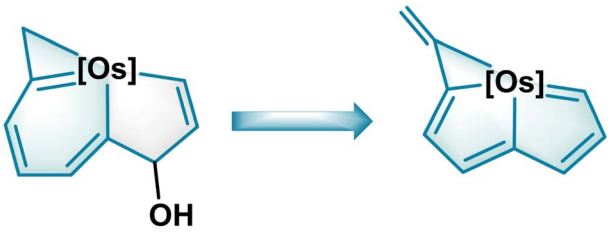
Hao-Ran Shen, Chao-Xing Li, Xin Jiang, Yao Lin, Jian-Hua Liu, Fang Zhu, Zhu-Lian Wu, Tian Cai, Wei Wen,* Rong-Xing He and Qi-Xiang Guo*



Open Access Article. Published on 31 May 2023. Downloaded on 1/23/2026 12:07:12 AM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

EDGE ARTICLES

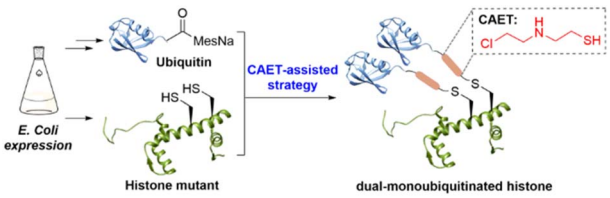
5672



Reshaping aromatic frameworks: expansion of aromatic system drives metallabenzenoids to metallapentalenes

Qian Li, Jiawei Fei, Kaidong Ruan, Yuhui Hua, Dafa Chen, Ming Luo* and Haiping Xia*

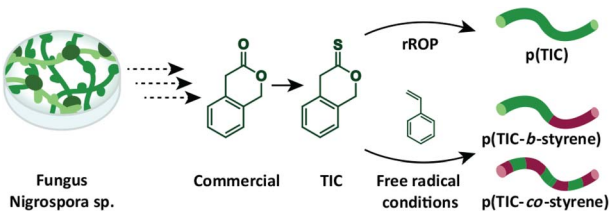
5681



The expedient, CAET-assisted synthesis of dual-monoubiquitinated histone H3 enables evaluation of its interaction with DNMT1

Zichen Li, Zebin Tong, Qingyue Gong, Huasong Ai,* Shuai Peng, Cong Chen, Guo-Chao Chu and Jia-Bin Li*

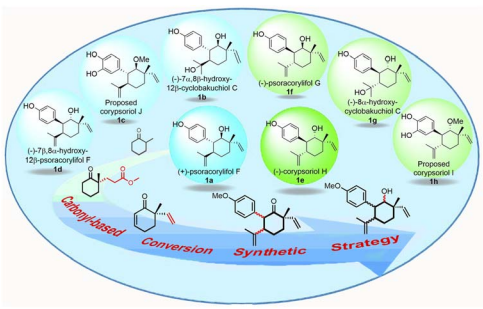
5689



Radical ring-opening polymerization of sustainably-derived thionoisochromanone

Emily A. Prebihalo, Anna M. Luke, Yernaidu Reddi, Christopher J. LaSalle, Vijay M. Shah, Christopher J. Cramer and Theresa M. Reineke*

5699



Enantioselective total syntheses of six natural and two proposed meroterpenoids from *Psoralea corylifolia*

Xiao-Wei Chen, Zi-Chao Hou, Chi Chen, Ling-Hui Zhang, Meng-En Chen and Fu-Min Zhang*

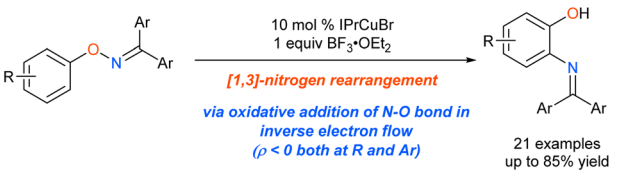
This journal is © The Royal Society of Chemistry 2023

Open Access Article. Published on 31 May 2023. Downloaded on 1/23/2026 12:07:12 AM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

5705

Copper-catalyzed [1,3]-nitrogen rearrangement of *O*-aryl ketoximes *via* oxidative addition of N–O bond in inverse electron flow

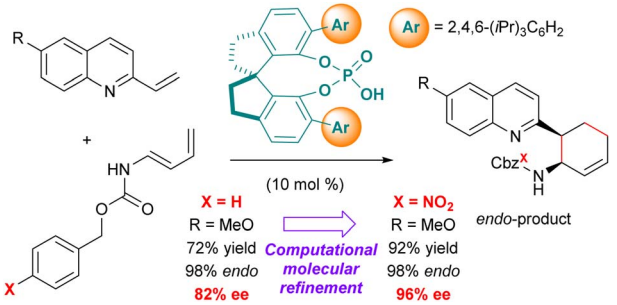
Mao Suzuki, Masahiro Terada and Itaru Nakamura*



5712

Computational molecular refinement to enhance enantioselectivity by reinforcing hydrogen bonding interactions in major reaction pathway

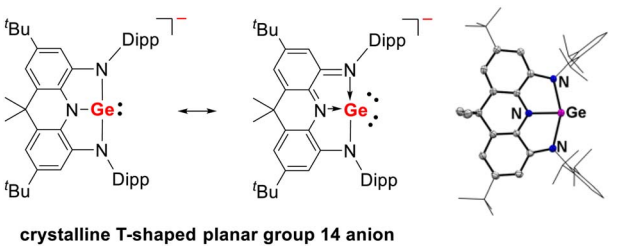
Taishi Nakanishi and Masahiro Terada*



5722

A crystalline T-shaped planar group 14 anion

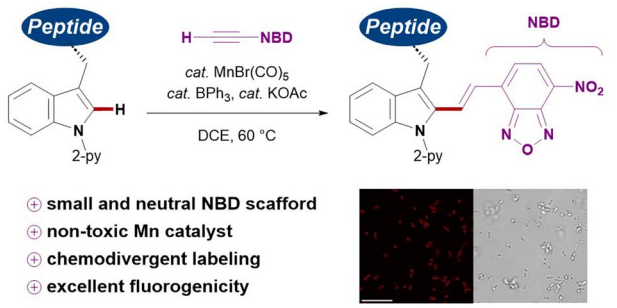
Xiaona Liu, Yuyang Dai, Manling Bao, Wenjuan Wang, Qianli Li, Chunmeng Liu, Xinping Wang* and Yuanting Su*



5728

Late-stage peptide labeling with near-infrared fluorogenic nitrobenzodiazoles by manganese-catalyzed C–H activation

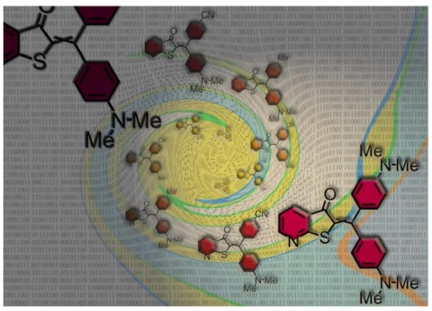
Tsuyoshi Oyama, Lorena Mendive-Tapia, Verity Cowell, Adelina Kopp, Marc Vendrell* and Lutz Ackermann*



Open Access Article. Published on 31 May 2023. Downloaded on 1/23/2026 12:07:12 AM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

EDGE ARTICLES

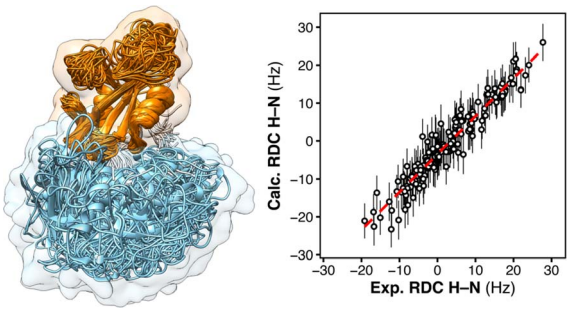
5734



A cross-conjugation approach for high-performance diaryl-hemithioindigo photoswitches

Max Zitzmann, Frank Hampel and Henry Dube*

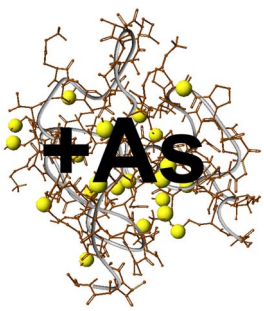
5743



Experiment-guided molecular simulations define a heterogeneous structural ensemble for the *PTPN11* tandem SH2 domains

Michelangelo Marasco, John Kirkpatrick, Teresa Carlomagno, Jochen S. Hub and Massimiliano Anselmi*

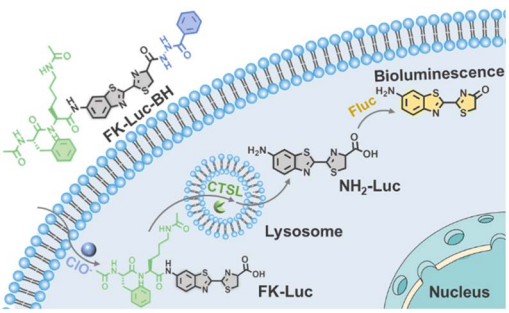
5756



Arsenic binding to human metallothionein-3

Amelia T. Yuan and Martin J. Stillman*

5768



An AND-gate bioluminescent probe for precise tumor imaging

Chenchen Wang, Yajian Hong, Ling Dong, Hu Cheng, Duo Jin, Ronghua Zhao, Zian Yu and Yue Yuan*

This journal is © The Royal Society of Chemistry 2023

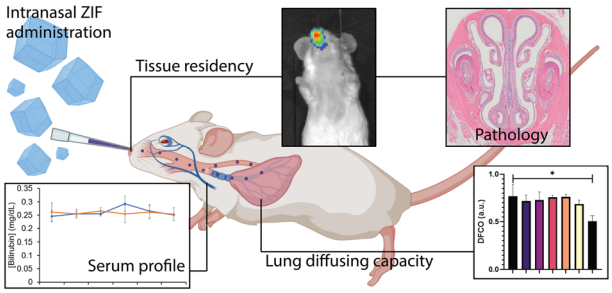
Open Access Article. Published on 31 May 2023. Downloaded on 1/23/2026 12:07:12 AM.
This article is licensed under a Creative Commons Attribution 3.0 Unported Licence.

EDGE ARTICLES

5774

In vivo biocompatibility of ZIF-8 for slow release *via* intranasal administration

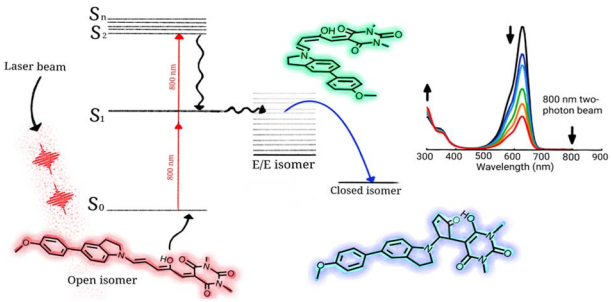
Sneha Kumari,* Thomas S. Howlett, Ryanne N. Ehrman, Shailendra Koirala, Orikeda Trashi, Ikeda Trashi, Yalini H. Wijesundara and Jeremiah J. Gassensmith*



5783

Two-photon isomerization properties of donor–acceptor Stenhouse adducts

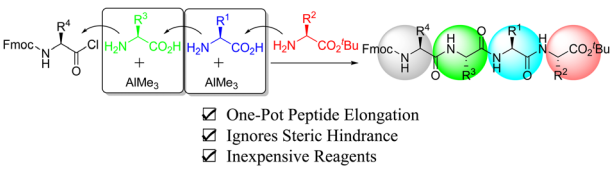
Francisco A. Reza-González, Emmanuel Villatoro, Mariana M. Reza, Jesús Jara-Cortés, Héctor García-Ortega, Edgard F. Blanco-Acuña, José G. López-Cortés, Nuria Esturau-Escofet, Alan Aguirre-Soto and Jorge Peon*



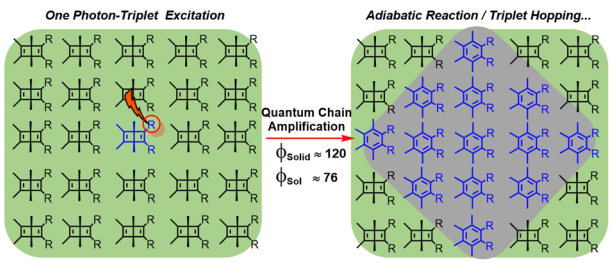
5795

Trimethylaluminum-mediated one-pot peptide elongation

Tomohiro Hattori* and Hisashi Yamamoto*



5802

Quantum chain amplification in nanocrystalline Dewar benzenes by intramolecular sensitization

Edris Rivera, Indrajit Paul, Javier Fajardo, Jr and Miguel A. Garcia-Garibay*