

# Chemical Science

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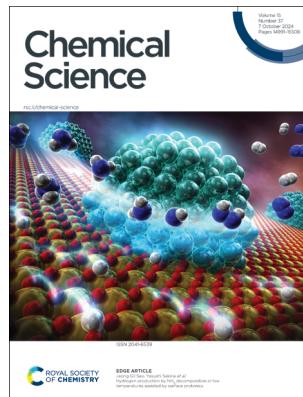
## IN THIS ISSUE

ISSN 2041-6539 CODEN CSHCBM 15(37) 14991–15506 (2024)



### Cover

See Mahendiran Dharmasivam, Des R. Richardson et al., pp. 15109–15124. Image reproduced by permission of Des R. Richardson and Mahendiran Dharmasivam from *Chem. Sci.*, 2024, 15, 15109.



### Inside cover

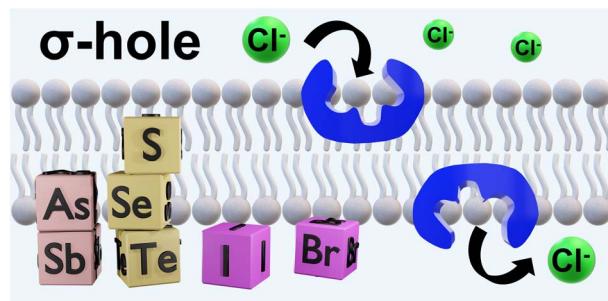
See Jeong Gil Seo, Yasushi Sekine et al., pp. 15125–15133. Image reproduced by permission of Yasushi Sekine from *Chem. Sci.*, 2024, 15, 15125.

## PERSPECTIVE

15006

### Anion transporters based on halogen, chalcogen, and pnictogen bonds: towards biological applications

Anurag Singh, Aaron Torres-Huerta, Franck Meyer and Hennie Valkenier\*

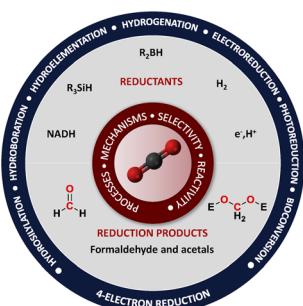


## REVIEWS

15023

### Four-electron reduction of CO<sub>2</sub>: from formaldehyde and acetal synthesis to complex transformations

Sarah Desmons, Julien Bonin,\* Marc Robert\* and Sébastien Bontemps\*



# EES Batteries

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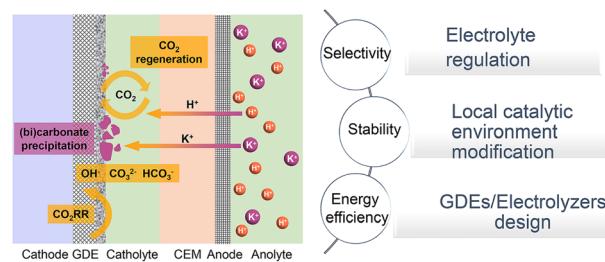
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## REVIEWS

15087

**Accelerating acidic CO<sub>2</sub> electroreduction: strategies beyond catalysts**

Bangwei Deng,\* Daming Sun, Xueyang Zhao, Lili Wang, Feiyu Ma, Yizhao Li\* and Fan Dong\*

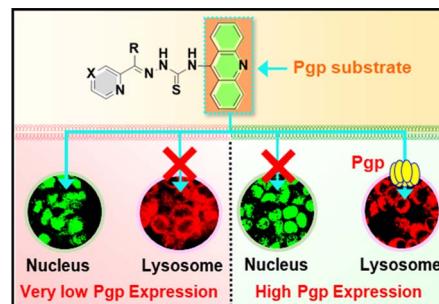


## EDGE ARTICLES

15109

**Targeting lysosomes by design: novel N-acridine thiosemicarbazones that enable direct detection of intracellular drug localization and overcome P-glycoprotein (Pgp)-mediated resistance**

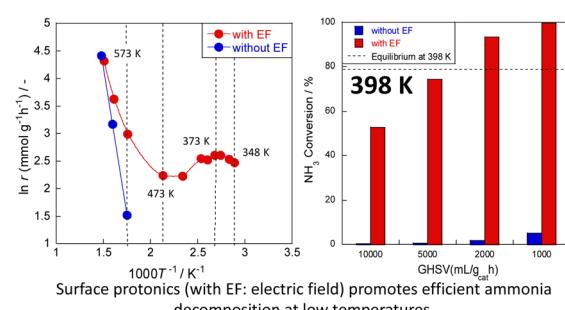
Busra Kaya, Henry Smith, Yanbing Chen, Mahan Gholam Azad, Tiffany M. Russell, Vera Richardson, Paul V. Bernhardt, Mahendiran Dharmasivam\* and Des R. Richardson\*



15125

**Hydrogen production by NH<sub>3</sub> decomposition at low temperatures assisted by surface protonics**

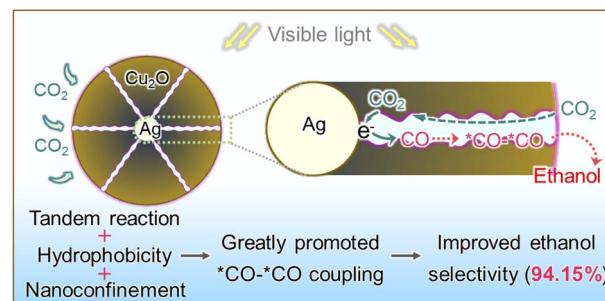
Yukino Ofuchi, Kenta Mitarai, Sae Doi, Koki Saegusa, Mio Hayashi, Hiroshi Sampei, Takuma Higo, Jeong Gil Seo\* and Yasushi Sekine\*



15134

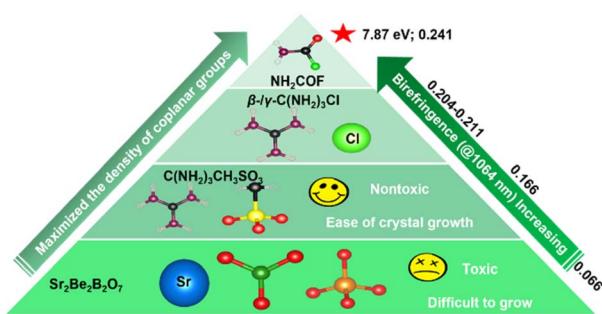
**Nanoconfined tandem three-phase photocatalysis for highly selective CO<sub>2</sub> reduction to ethanol**

Hailing Huo, Ting Hu, Zhiqing Zhong, Cheng Zhan, Chengxi Huang, Qiang Ju, Liang Zhang, Fang Wu, Erjun Kan\* and Ang Li\*



## EDGE ARTICLES

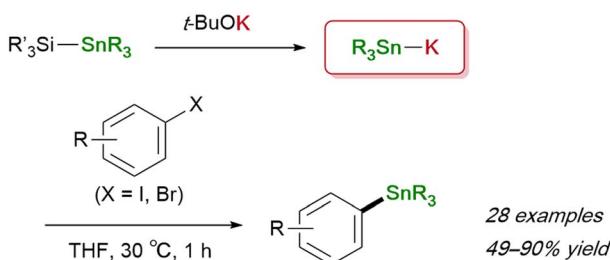
15145



## Strategically designed metal-free deep-ultraviolet birefringent crystals with superior optical properties

Yang Li, Xinglong Chen\* and Kang Min Ok\*

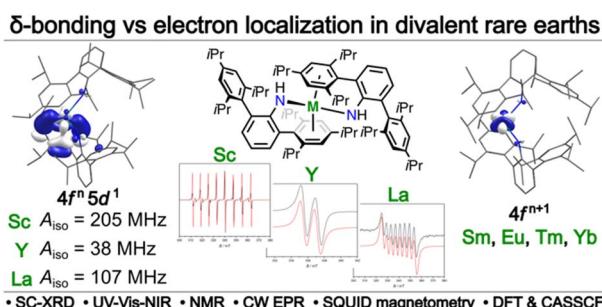
15152



## Surefire generation of stannylpotassium: highly reactive stannyl anions and applications

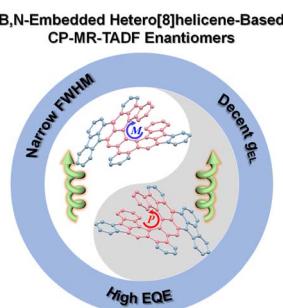
Yuta Hiraoka, Taiki Imagawa, Kazuki Nakanishi, Hinata Kawabe, Masaaki Nakamoto, Takumi Tsuchiya and Hiroto Yoshida\*

15160

 $\delta$ -Bonding modulates the electronic structure of formally divalent  $nd^1$  rare earth arene complexes

Ross E. MacKenzie, Tomáš Hajdu, John A. Seed, George F. S. Whitehead, Ralph W. Adams, Nicholas F. Chilton, David Collison, Eric J. L. McInnes and Conrad A. P. Goodwin\*

15170



## Efficient circularly polarized multiple resonance thermally activated delayed fluorescence from B,N-embedded hetero[8]helicene enantiomers

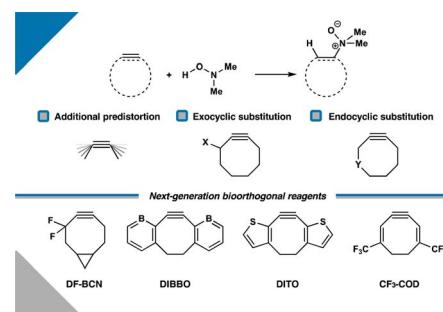
Tingting Huang, Li Yuan, Xueying Lu, Yupei Qu, Cheng Qu, Yincai Xu,\* You-Xuan Zheng\* and Yue Wang\*

## EDGE ARTICLES

15178

**Retro-Cope elimination of cyclic alkynes: reactivity trends and rational design of next-generation bioorthogonal reagents**

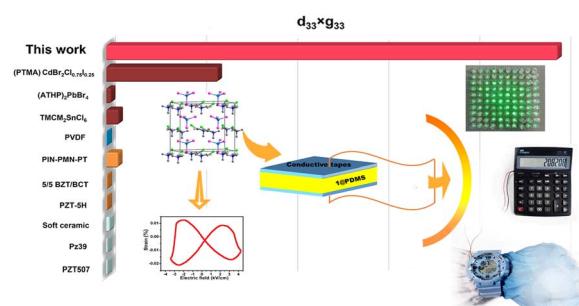
Steven E. Beutick, Song Yu, Laura Orian,  
F. Matthias Bickelhaupt and Trevor A. Hamlin\*



15192

**Achievement of a giant electromechanical conversion coefficient in a molecule-based ferroelectric**

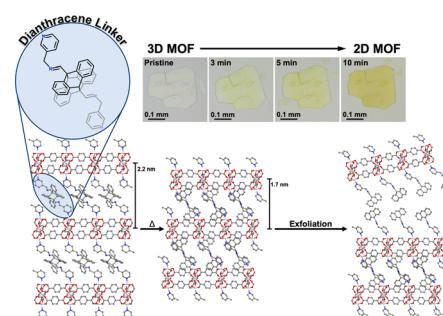
Bin Wang, Zhirui Li, Zhengxiao Tang, Haixia Zhao,\*  
Lasheng Long\* and Lansun Zheng



15198

**Exfoliation of a metal–organic framework enabled by post-synthetic cleavage of a dipyridyl dianthracene ligand**

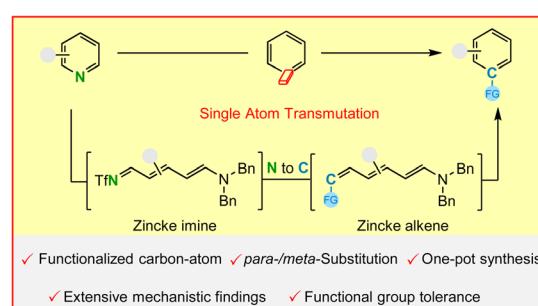
Madison E. Logelin, Eric Schreiber, Brandon Q. Mercado,  
Michael J. Burke, Caitlin M. Davis and Amy Marie  
K. Bartholomew\*



15205

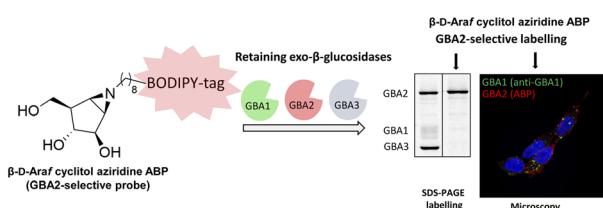
**Nitrogen-to-functionalized carbon atom transmutation of pyridine**

Fu-Peng Wu, Madina Lenz, Adhya Suresh, Achyut  
R. Gogoi, Jasper L. Tyler, Constantin G. Daniliuc,  
Osvaldo Gutierrez\* and Frank Glorius\*



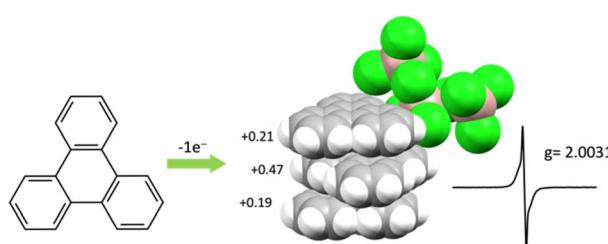
## EDGE ARTICLES

15212

**Selective labelling of GBA2 in cells with fluorescent  $\beta$ -D-arabinofuranosyl cyclitol aziridines**

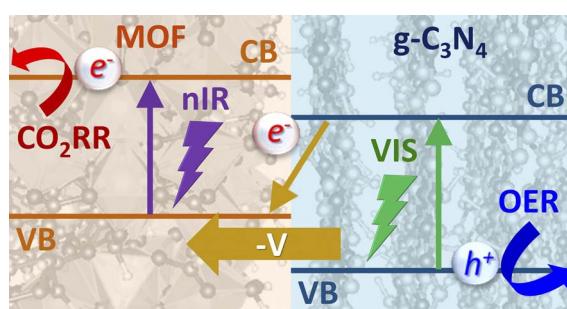
Qin Su, Max Louwerse, Rob F. Lammers, Elmer Maurits, Max Janssen, Rolf G. Boot, Valentina Borlandelli, Wendy A. Offen, Daniël Linzel, Sybrin P. Schröder, Gideon J. Davies, Herman S. Overkleef, Marta Artola\* and Johannes M. F. G. Aerts\*

15221

**A unique trimeric triphenylene radical cation: stacking aggregation, bonding, and stability**

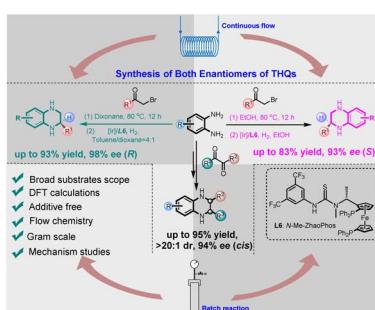
Rameswar Bhattacharjee, Megan E. McCormack, Zheng Zhou, Zheng Wei, Marina A. Petrukhina\* and Miklos Kertesz\*

15232

**Engineering MOF/carbon nitride heterojunctions for effective dual photocatalytic CO<sub>2</sub> conversion and oxygen evolution reactions**

Valentin Diez-Cabanes, Kevin Granados-Tavera, Inderdip Shere, Gloria Cárdenas-Jirón and Guillaume Maurin\*

15243

**Highly enantioselective synthesis of both enantiomers of tetrahydroquinoxaline derivatives via Ir-catalyzed asymmetric hydrogenation**

Ana Xu, Lanxing Ren, Junrong Huang, Yuxiang Zhu, Gang Wang, Chaoyi Li, Yongqiang Sun, Lijuan Song,\* Hengzhi You\* and Fen-Er Chen\*

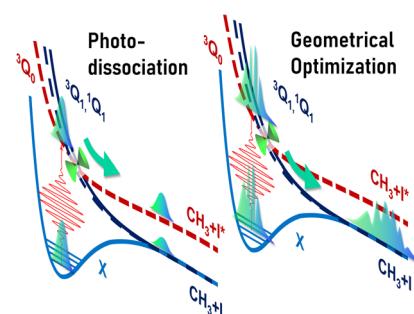


## EDGE ARTICLES

15255

**Absolute control over the quantum yield of a photodissociation reaction mediated by nonadiabatic couplings**

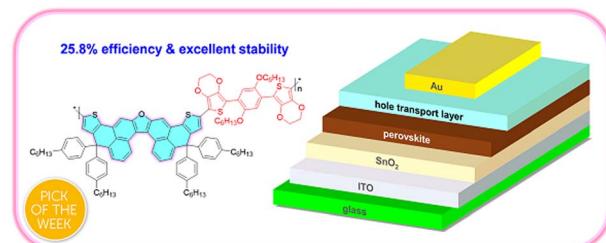
Ignacio R. Sola\* and Alberto García-Vela\*



15263

**Conjugated polymers of an oxa[5]helicene-derived polycyclic heteroaromatic: tailoring energy levels and compatibility for high-performance perovskite solar cells**

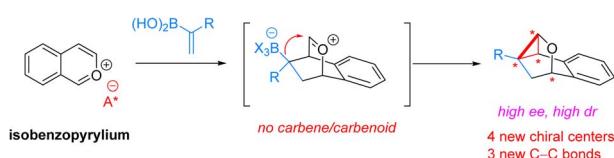
Yaohang Cai, Yuyan Zhang, Lingyi Fang, Yutong Ren, Jidong Zhang, Yi Yuan, Jing Zhang and Peng Wang\*



15274

**Organocatalytic enantio- and diastereoselective assembly of cyclopropane-incorporated polycyclic molecules via isobenzopyrylium ions**

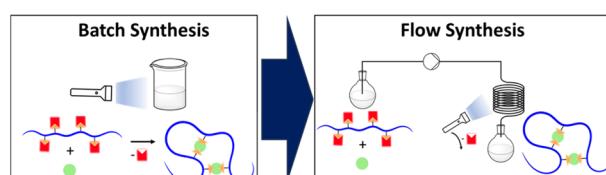
Shuxuan Liu, Chaoshen Zhang,\* Zhengyu Han, Hai Huang and Jianwei Sun\*



15280

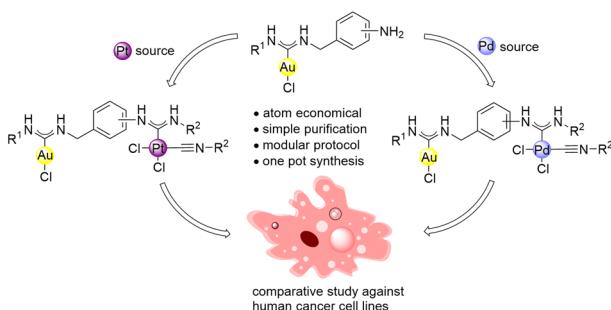
**Visible light photoflow synthesis of a Cu(II) single-chain polymer nanoparticle catalyst**

Sebastian Gillhuber, Joshua O. Holloway, Kai Mundsinger, Jochen A. Kammerer, Jeffrey R. Harmer, Hendrik Frisch,\* Christopher Barner-Kowollik\* and Peter W. Roesky\*



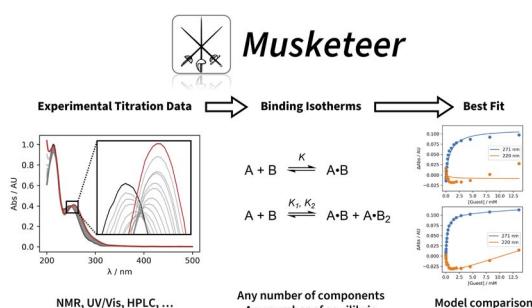
## EDGE ARTICLES

15291

**Comparative study of the antiproliferative activity of heterometallic carbene gold(I)-platinum(II) and gold(I)-palladium(II) complexes in cancer cell lines**

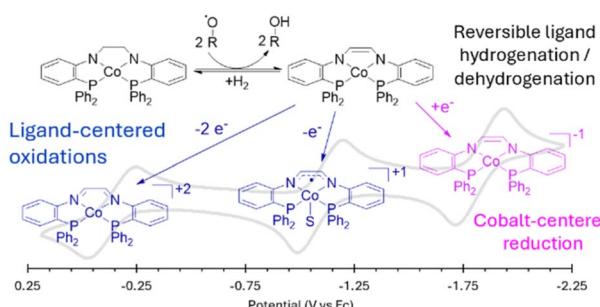
Martin C. Dietl, Melina Maag, Sophia Ber, Frank Rominger, Matthias Rudolph, Isabella Caligiuri, Pacome K. Andele, Ibraheem A. I. M Khalid, Flavio Rizzolio, Pablo A. Nogara, Laura Orian, Thomas Scattolin\* and A. Stephen K. Hashmi\*

15299

**Musketeer: a software tool for the analysis of titration data**

Daniil O. Soloviev and Christopher A. Hunter\*

15311

**Hydrogen atom abstraction as a synthetic route to a square planar Co<sup>II</sup> complex with a redox-active tetradentate PNNP ligand**

Justin D. Miller, Mitchell M. Walsh, Kyoungsoon Lee, Curtis E. Moore and Christine M. Thomas\*

15321

**Integrated "all-in-one" strategy to construct highly efficient Pd catalyst for CO<sub>2</sub> transformation**

Lingfang Kong, Zekun Tao, Yunjia Li, Huiwen Gong, Yun Bai, Longbin Li, Xianjin Zhang, Zhonggao Zhou\* and Yiwang Chen\*

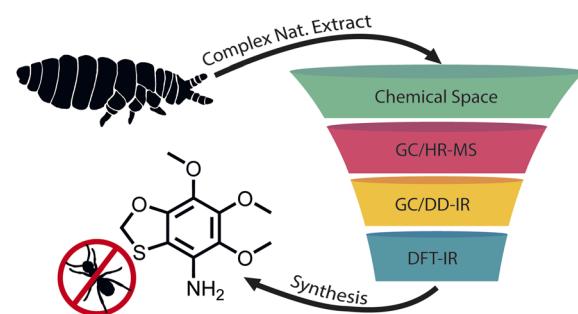


## EDGE ARTICLES

15332

**Identification of unique highly hetero-substituted benzenes as chemical weapons of springtails by a combination of trace analytical methods with DFT calculations and synthesis**

Anton Möllerke, Matthew Stell, Christian Schlawis, Ute Trauer-Kizilelma, Jennifer Herrmann, Hans Petter Leinaas, Stefan Scheu and Stefan Schulz\*

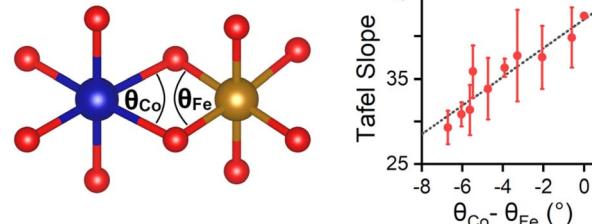


15339

**Interplay between element-specific distortions and electrocatalytic oxygen evolution for cobalt–iron hydroxides**

Elif Pinar Alsaç, Marlyn Boke, Justine R. Bissonnette and Rodney D. L. Smith\*

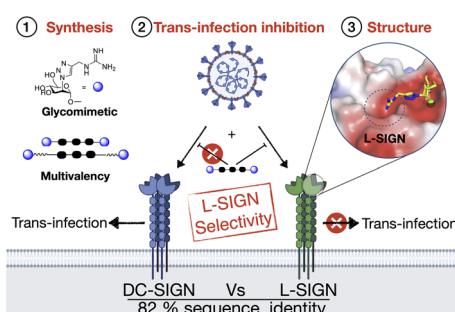
$\text{Fe-O} \neq \text{Co-O}$   
angular distortion → electrocatalysis



15352

**Unprecedented selectivity for homologous lectin targets: differential targeting of the viral receptors L-SIGN and DC-SIGN**

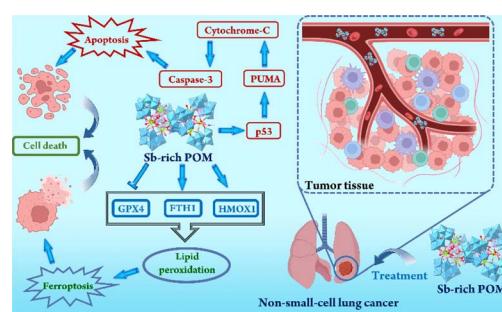
Clara Delaunay, Sara Pollastri, Michel Thépaut, Gianluca Cavazzoli, Laura Belvisi, Clémentine Bouchikri, Nuria Labiod, Fatima Lasala, Ana Gimeno, Antonio Franconetti, Jesús Jiménez-Barbero, Ana Ardá, Rafael Delgado, Anna Bernardi\* and Franck Fieschi\*



15367

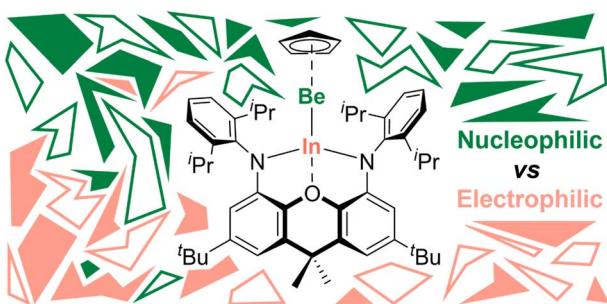
**Antitumor effects of a Sb-rich polyoxometalate on non-small-cell lung cancer by inducing ferroptosis and apoptosis**

Jie-Wei Lin, Yang Zhou, Hui-Ping Xiao, Lei-Lei Wu, Peng-Cheng Li, Ming-Dong Huang, Dong Xie,\* Peng Xu,\* Xin-Xiong Li\* and Zhi-Xin Li\*



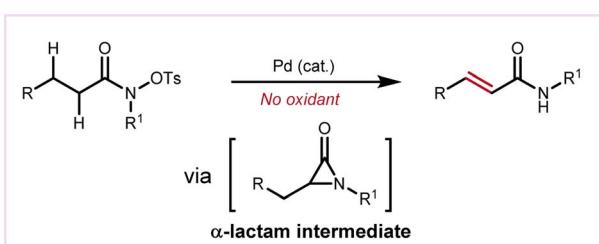
## EDGE ARTICLES

15377

**On the nature and limits of alkaline earth–trial bonding**

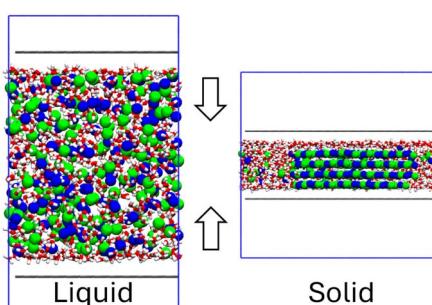
Josef T. Boronski,\* Liam P. Griffin, Caroline Conder, Agamemnon E. Crumpton, Lewis L. Wales and Simon Aldridge\*

15385

**Catalytic dehydrogenative synthesis of  $\alpha,\beta$ -unsaturated secondary amides without external oxidants**

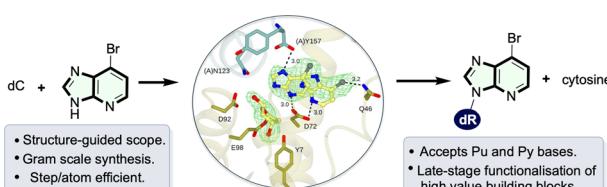
Shaokang An, Guoyin Lai and Wenbo H. Liu\*

15391

**Atomic scale insights into NaCl nucleation in nanoconfined environments**

Ruiyu Wang and Pratyush Tiwary\*

15399

**Gram-scale enzymatic synthesis of 2'-deoxyribonucleoside analogues using nucleoside transglycosylase-2**

Admir Salihovic, Alex Ascham, Andrea Taladriz-Sender, Samantha Bryson, Jamie M. Withers, Iain J. W. McKean, Paul A. Hoskisson, Gideon Grogan\* and Glenn A. Burley\*



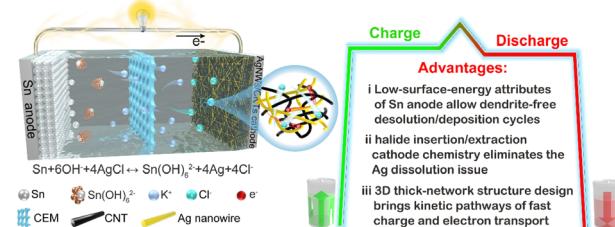
## EDGE ARTICLES

15408

**Decoupled tin–silver batteries with long cycle life and power output stability based on dendrite-free tin anode and halide insertion cathode chemistry**

Feifei Shi, Yudong Wu, Binyan Wang, Jiawei Bai, Yihan Ren, Tao Yang, Funian Mo,\* Derek Ho and Haibo Hu\*

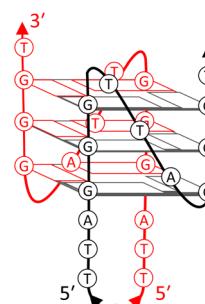
*Decoupled Sn–Ag Batteries*



15417

**Inverted strand polarity yields thermodynamically stable G-quadruplexes and prevents duplex formation within extended DNA**

Bruce Chilton, Ruby J. Roach, Patrick J. B. Edwards, Geoffrey B. Jameson, Tracy K. Hale and Vyacheslav V. Filichev\*

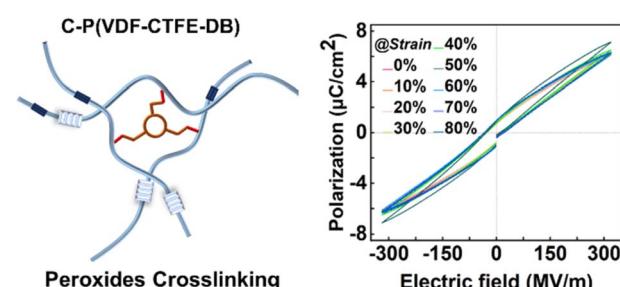


- Increased G4 Thermal Stability
- Preference for Parallel Topology
- Significant Reduction in Duplex Formation
- Interacts with G4 binders (hinge of HP1α)

15432

**Highly elastic relaxor ferroelectric via peroxide crosslinking**

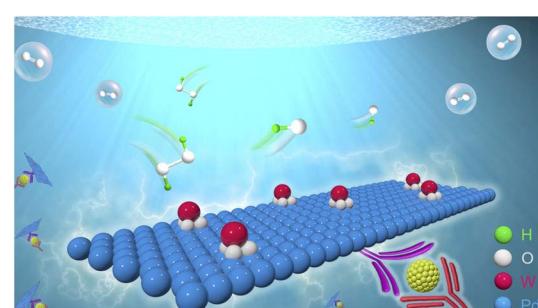
Liang Gao, Liping Wang and Ben-Lin Hu\*



15440

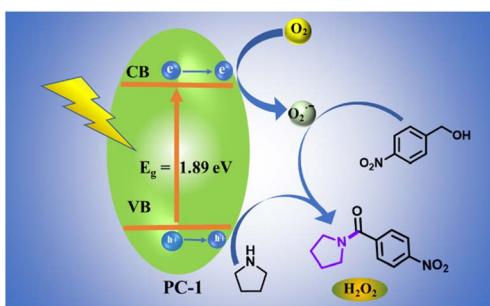
**Oxygen-bridged W-Pd atomic pairs enable H<sub>2</sub>O<sub>2</sub> activation for sensitive immunoassays**

Chengjie Chen, Dongbo Yan, Xiangkun Jia, Ruimin Li, Lijun Hu, Xiaotong Li, Lei Jiao,\* Chengzhou Zhu, Yanling Zhai\* and Xiaoquan Lu



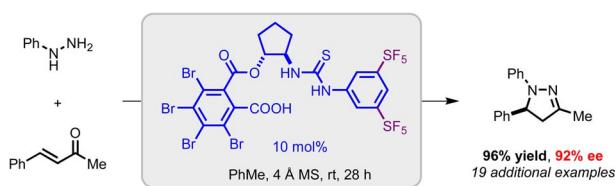
## EDGE ARTICLES

15448


**Visible light-driven molecular oxygen activation for oxidative amidation of alcohols using lead-free metal halide perovskite**

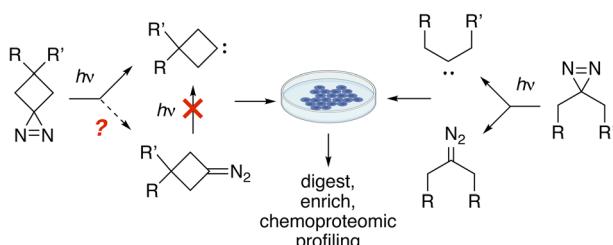
Vishesh Kumar, Ved Vyas, Deepak Kumar, Ashish Kumar Kushwaha and Arindam Indra\*

15456


**Catalytic enantioselective synthesis of 2-pyrazolines via one-pot condensation/6π-electrocyclization: 3,5-bis(pentafluorosulfanyl)-phenylthioureas as powerful hydrogen bond donors**

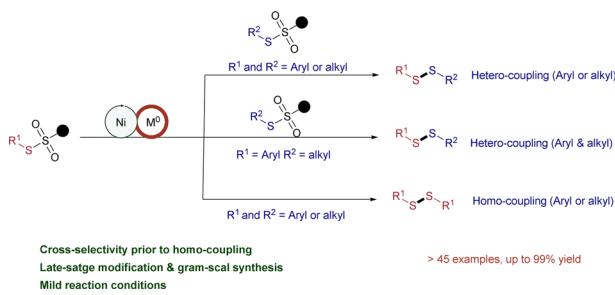
Moises A. Romero Reyes, Subhradeep Dutta, Minami Odagi, Chang Min and Daniel Seidel\*

15463


**Mechanistic differences between linear vs. spirocyclic dialkyldiazirine probes for photoaffinity labeling**

Jessica G. K. O'Brien, Louis P. Conway, Paramesh K. Ramaraj, Appaso M. Jadhav, Jun Jin, Jason K. Dutra, Parrish Evers, Shadi S. Masoud, Manuel Schupp, Iakovos Saridakis, Yong Chen, Nuno Maulide, John P. Pezacki, Christopher W. am Ende,\* Christopher G. Parker\* and Joseph M. Fox\*

15474


**Nickel-catalyzed selective disulfide formation by reductive cross-coupling of thiosulfonates**

Tingting Yuan, Xiang-Yu Chen, Tengfei Ji, Hufeng Yue, Kathiravan Murugesan and Magnus Rueping\*

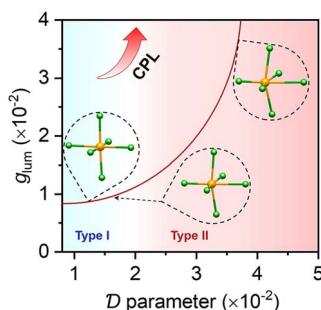


## EDGE ARTICLES

15480

**Boosting circularly polarized luminescence by optimizing off-centering octahedral distortion in zero-dimensional hybrid indium-antimony halides**

Yulian Liu, Yi Wei, Zhishan Luo, Bin Xu, Meiyi He, Peibin Hong, Chen Li and Zewei Quan\*



15489

**Ni-catalyzed enantioselective three-component reductive alkylacylation of alkenes: modular access to structurally complex  $\alpha$ -amino ketones**

Jichao Xiao, Tingting Jia, Shuang Chen, Mengxiao Pan and Xingwei Li\*



15496

**Films of linear conjugated polymer as photoanodes for oxidation reactions**

Shuming Chai, Shun Zhao, Jiaxin Su, Jinshui Zhang, Xiong Chen,\* Reiner Sebastian Sprick\* and Yuanxing Fang

