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 15(15) 5405–5788 (2024)

Cover
See Nathan T. Coles, Samuel E. Neale, Christian Müller *et al.*, pp. 5496–5506. Image reproduced by permission of Richard Otto Kopp from *Chem. Sci.*, 2024, **15**, 5496.

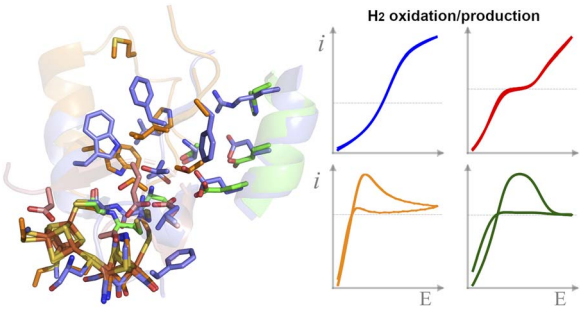
Inside cover
See Christophe Léger *et al.*, pp. 5418–5433. Image reproduced by permission of Laurent Eisler from *Chem. Sci.*, 2024, **15**, 5418. Artwork by Laurent Eisler.

PERSPECTIVES

5418

Outer-sphere effects on the O_2 sensitivity, catalytic bias and catalytic reversibility of hydrogenases

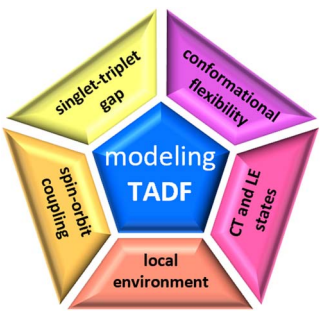
Andrea Fasano, Vincent Fourmond and Christophe Léger*



5434

Shedding light on thermally-activated delayed fluorescence

Francesco Di Maiolo, D. K. Andrea Phan Huu, Davide Giavazzi, Andrea Landi, Ottavia Racchi and Anna Painelli*



ROYAL SOCIETY OF CHEMISTRY

GOLD OPEN ACCESS

RSC Applied Polymers

The application of polymers, both natural and synthetic

Interdisciplinary and open access

rsc.li/RSCApplPolym

Fundamental questions
Elemental answers

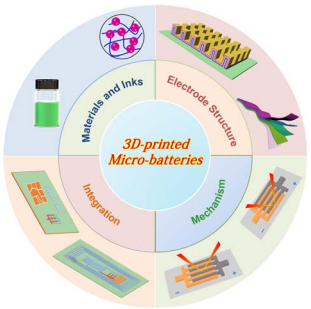
Registered charity number: 207890

REVIEWS

5451

The status and challenging perspectives of 3D-printed micro-batteries

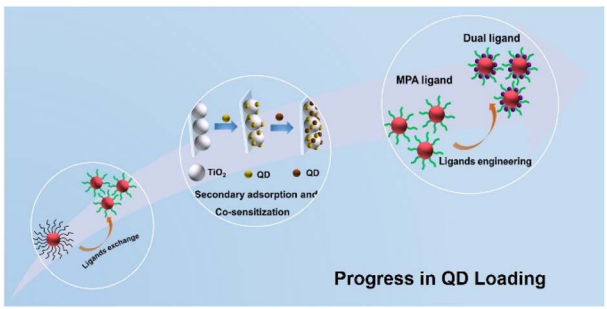
Jiaxin Ma, Shuanghao Zheng,* Yinghua Fu, Xiao Wang, Jieqiong Qin and Zhong-Shuai Wu*



5482

Improving the efficiency of quantum dot-sensitized solar cells by increasing the QD loading amount

Zhengyan Zhang, Wenran Wang, Huashang Rao, Zhenxiao Pan* and Xinhua Zhong*

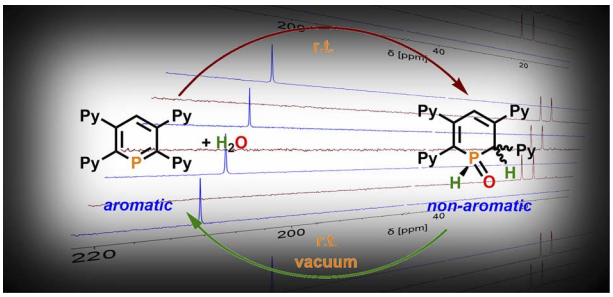


EDGE ARTICLES

5496

Highly selective, reversible water activation by P,N-cooperativity in pyridyl-functionalized phosphinines

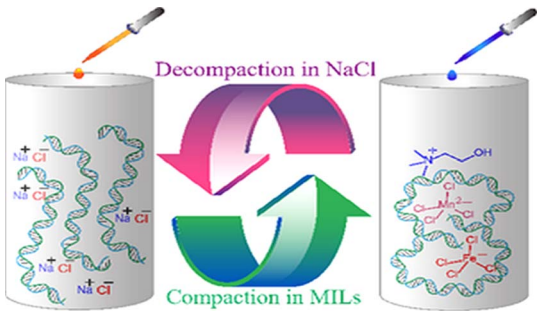
Richard O. Kopp, Sabrina L. Kleynemeyer, Lucie J. Groth, Moritz J. Ernst, Susanne M. Rupf, Manuela Weber, Laurence J. Kershaw Cook, Nathan T. Coles,* Samuel E. Neale* and Christian Müller*



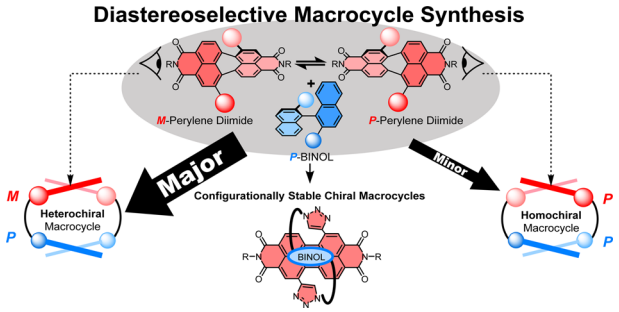
5507

Critical assessment of interactions between ct-DNA and choline-based magnetic ionic liquids: evidences of compaction

Kiran Devi Tulsiyan, Saroj Kumar Panda, Malay Kumar Rana* and Himansu S. Biswal*



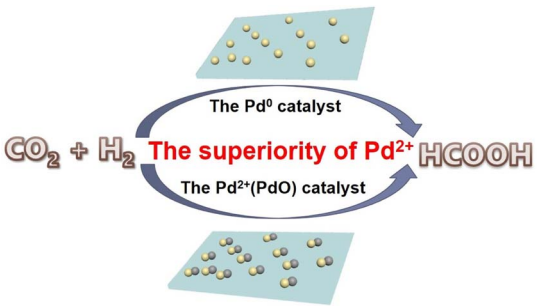
5516



Investigating the diastereoselective synthesis of a macrocycle under Curtin–Hammett control

Angus Yeung, Martijn A. Zwijnenburg, Georgia R. F. Orton, Jennifer H. Robertson and Timothy A. Barendt*

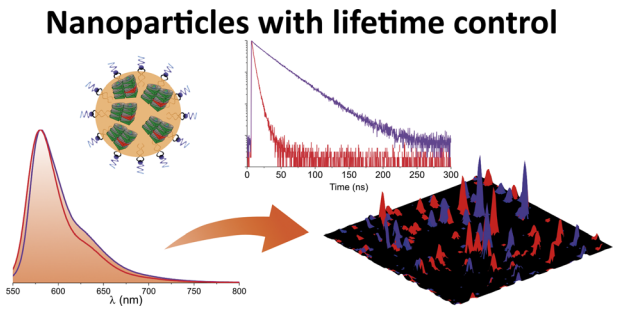
5525



The superiority of Pd^{2+} in CO_2 hydrogenation to formic acid

Yanyan Wang, Minghua Dong, Shaopeng Li, Bingfeng Chen, Huizhen Liu* and Buxing Han*

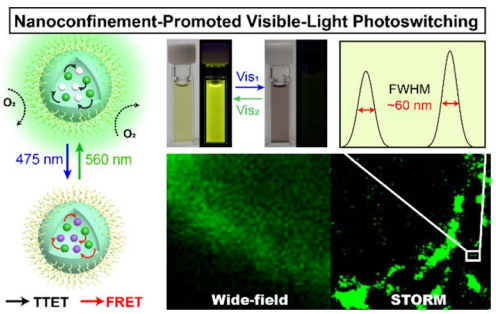
5531



Control of the fluorescence lifetime in dye based nanoparticles

Stine G. Stenspil, Junsheng Chen, Mikkel B. Liisberg, Amar H. Flood and Bo W. Laursen*

5539



Amplifying dual-visible-light photoswitching in aqueous media *via* confinement promoted triplet–triplet energy transfer

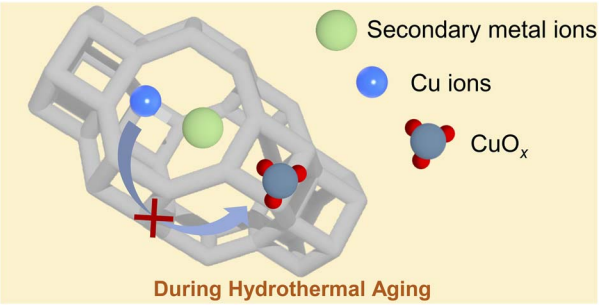
Wenhui Wang, Weixin Yang, Zhiwei Zhang, Jinghong Dai, Yisheng Xu and Junji Zhang*

EDGE ARTICLES

5548

Improving the hydrothermal stability of Al-rich Cu-SSZ-13 zeolite *via* Pr-ion modification

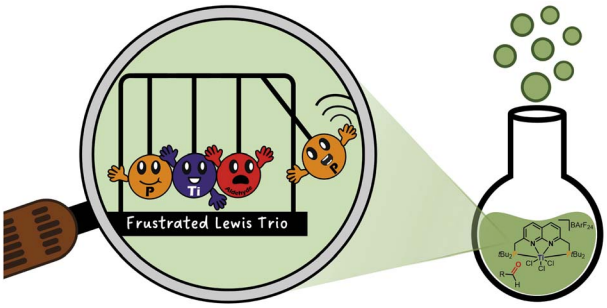
Mengyang Chen, Wenru Zhao, Yingzhen Wei, Shi-Bin Ren, Yuxiang Chen, Donghai Mei,* De-Man Han* and Jihong Yu*



5555

Pendulum-like hemilability in a Ti-based frustrated Lewis Trio

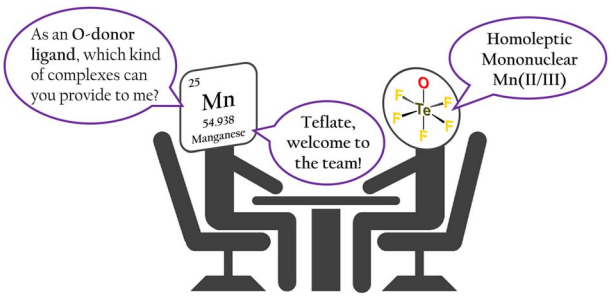
Errikos Kounalis, Dylan van Tongeren, Stanislav Melnikov, Martin Lutz and Daniël L. J. Broere*



5564

Questing for homoleptic mononuclear manganese complexes with monodentate O-donor ligands

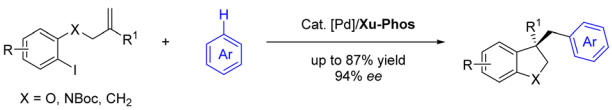
Alberto Pérez-Bitrián,* Julen Munárriz,* Konstantin B. Krause, Johanna Schlögl, Kurt F. Hoffmann, Johanna S. Sturm, Amiera N. Hadi, Christian Teutloff, Anja Wiesner, Christian Limberg and Sebastian Riedel*



5573

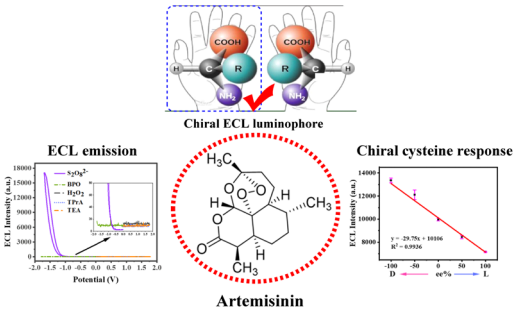
Palladium/XuPhos-catalyzed enantioselective cascade Heck/intermolecular C(sp^2)–H alkylation reaction

Chao Fang, Quan-Pu Wang, Bing Xu, Zhan-Ming Zhang* and Junliang Zhang*



EDGE ARTICLES

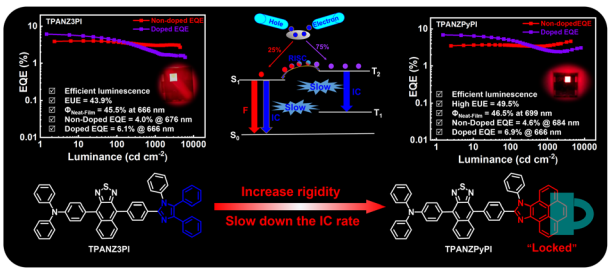
5581



Artemisinin: a novel chiral electrochemiluminescence luminophore-assisted enantiospecific recognition and mechanism identification

Jiangyan Wang, Zhengang Han, Tianrui Shang, Yanjun Feng, Ruirui Liu and Xiaoquan Lu*

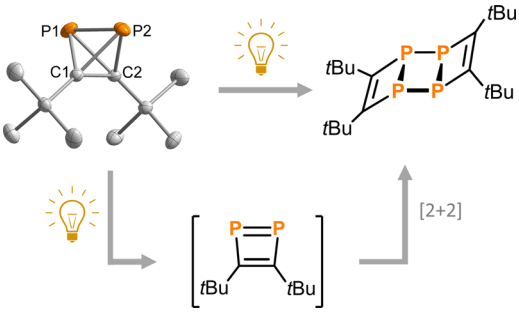
5589



Efficient near-infrared emission benefits from slowing down the internal conversion process

Mingliang Xie, Yannan Zhou, Huayi Zhou, Chengling Ma, Qikun Sun, Shi-Tong Zhang, Yujian Zhang,* Wenjun Yang and Shanfeng Xue*

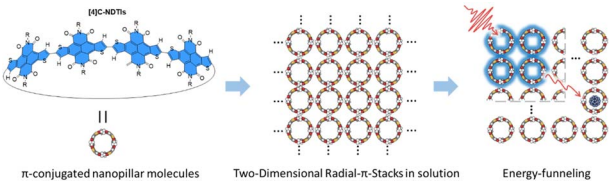
5596



Structure and photochemistry of di-*tert*-butyldiphosphatetrahedrane

Gabriele Hierlmeier,* Roger Jan Kutta, Peter Coburger, Hans-Georg Stammler, Jan Schwabedissen, Norbert W. Mitzel,* Maria Dimitrova, Raphael J. F. Berger, Patrick Nuernberger* and Robert Wolf*

5604



Two-dimensional radial-π-stacks in solution

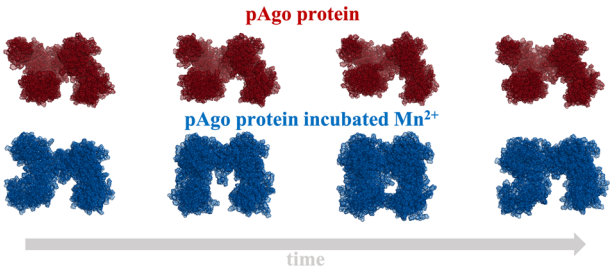
Feng Su, Yongseok Hong, Guilan Zhang, Kongchuan Wu, Juno Kim, Zhi Chen, Hui-Jun Zhang, Dongho Kim* and Jianbin Lin*

EDGE ARTICLES

5612

Mn^{2+}-induced structural flexibility enhances the entire catalytic cycle and the cleavage of mismatches in prokaryotic argonaute proteins

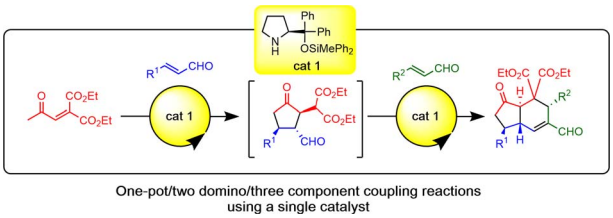
Lirong Zheng, Bingxin Zhou,* Yu Yang, Bing Zan, Bozitao Zhong, Banghao Wu, Yan Feng, Qian Liu* and Liang Hong*



5627

Organocatalyst-mediated asymmetric one-pot/two domino/three-component coupling reactions for the synthesis of *trans*-hydrindanes

Naoki Mori, Toshiki Tachibana, Nariyoshi Umekubo and Yujiro Hayashi*

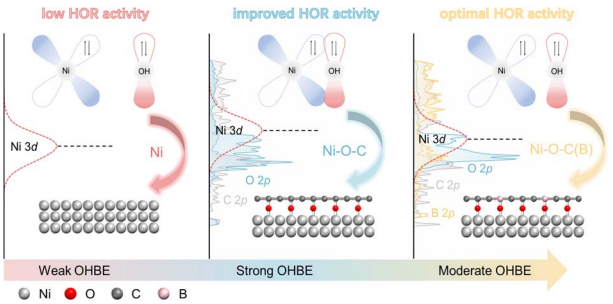


One-pot/two domino/three component coupling reactions using a single catalyst

5633

Revealing the role of a bridging oxygen in a carbon shell coated Ni interface for enhanced alkaline hydrogen oxidation reaction

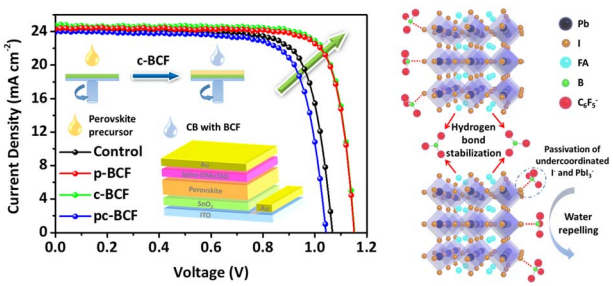
Pengyu Han, Xinyi Yang, Liqing Wu, Hongnan Jia and Wei Luo*



5642

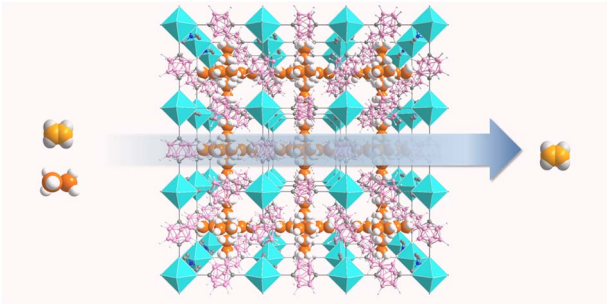
Engineering the passivation routes of perovskite films towards high performance solar cells

Liangzheng Zhu, Shendong Xu, Guozhen Liu, Long Liu, Han Zhou, Zhiqiang Ai, Xu Pan* and Fapei Zhang*



EDGE ARTICLES

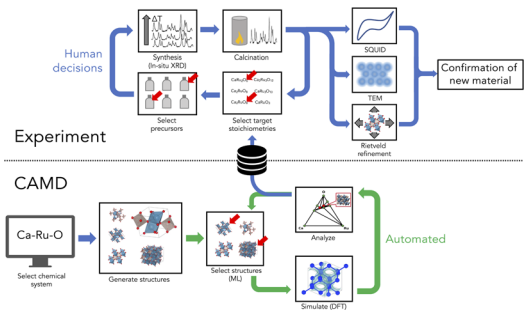
5653



A novel hydrophobic carborane-hybrid microporous material for reversed C_2H_6 adsorption and efficient C_2H_4/C_2H_6 separation under humid conditions

Lingyao Wang, Shuangshuang Wu, Jianbo Hu, Yunjia Jiang, Jiahao Li, Yongqi Hu, Yan Han, Teng Ben, Banglin Chen and Yuanbin Zhang*

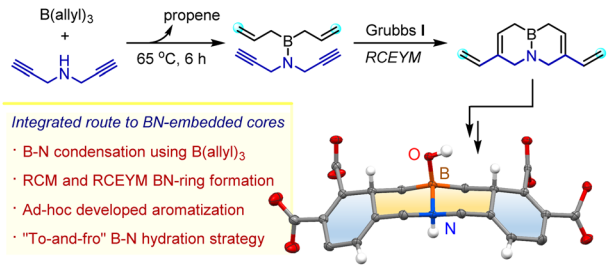
5660



How the AI-assisted discovery and synthesis of a ternary oxide highlights capability gaps in materials science

Joseph H. Montoya,* Carolyn Grimley, Muratahan Aykol, Colin Ophus, Hadas Sternlicht, Benjamin H. Savitzky, Andrew M. Minor, Steven B. Torrisi, Jackson Goedjen, Ching-Chang Chung, Andrew H. Comstock and Shijing Sun

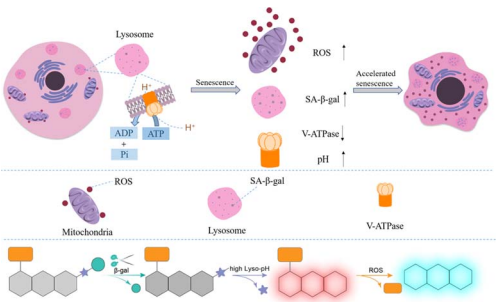
5674



From propenolysis to enyne metathesis: tools for expedited assembly of 4*a*,8*a*-azaboranaphthalene and extended polycycles with embedded BN

Federica Rulli, Guillem Sanz-Liarte, Pol Roca, Nina Martínez, Víctor Medina, Raimon Puig de la Bellacasa, Alexandr Shafir* and Ana B. Cuenca*

5681



A near-IR ratiometric fluorescent probe for the precise tracking of senescence: a multidimensional sensing assay of biomarkers in cell senescence pathways

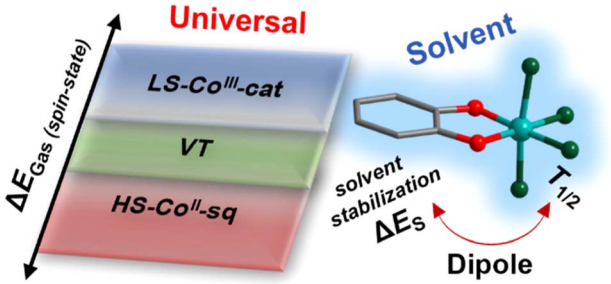
Haihong Liu, Ruidian Lv, Fuxiang Song, Yaqun Yang, Fei Zhang, Liantao Xin, Peng Zhang,* Qian Zhang* and Caifeng Ding*

EDGE ARTICLES

5694

Predicting valence tautomerism in diverse cobalt–dioxolene complexes: elucidation of the role of ligands and solvent

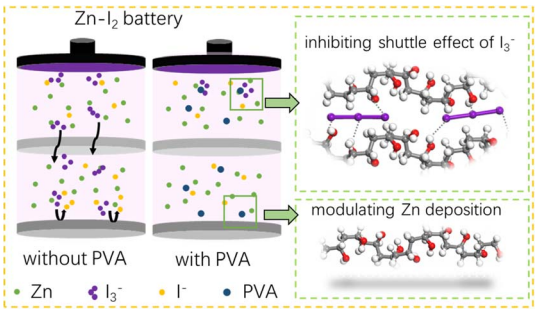
F. Zahra M. Zahir, Moya A. Hay, Jett T. Janetzki, Robert W. Gable, Lars Goerigk* and Colette Boskovic*



5711

Restraining the shuttle effect of polyiodides and modulating the deposition of zinc ions to enhance the cycle lifespan of aqueous Zn–I_2 batteries

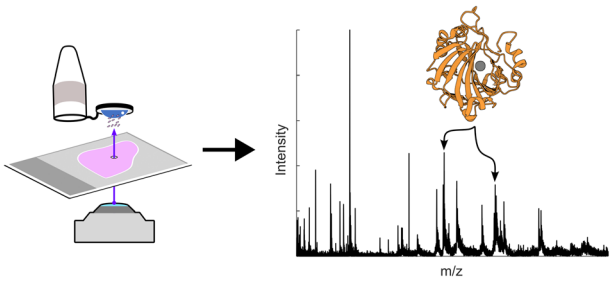
Qu Yue,* Yu Wan, Xiaoqin Li, Qian Zhao, Taotao Gao, Guowei Deng, Bing Li and Dan Xiao*



5723

Laser capture microdissection and native mass spectrometry for spatially-resolved analysis of intact protein assemblies in tissue

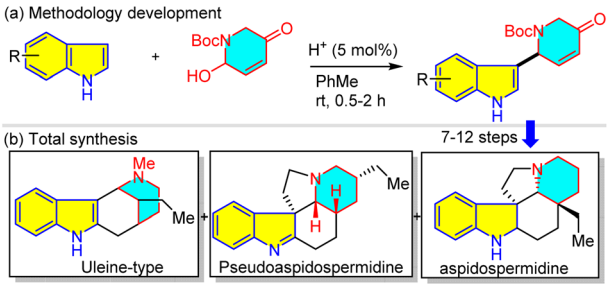
James W. Hughes, Emma K. Sisley, Oliver J. Hale and Helen J. Cooper*



5730

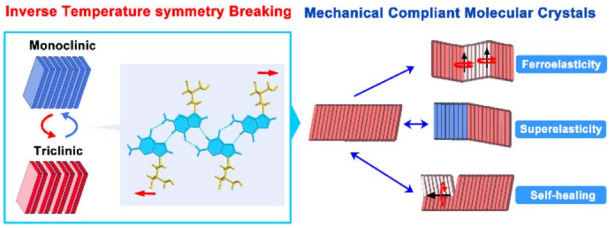
Aza-Achmatowicz rearrangement coupled with intermolecular aza-Friedel–Crafts enables total syntheses of uleine and aspidosperma alkaloids

Foqing Ma, Yunlong Li, Kornkamon Akkarasereenon, Huiying Qiu, Yuen Tsz Cheung, Zhihong Guo and Rongbiao Tong*



EDGE ARTICLES

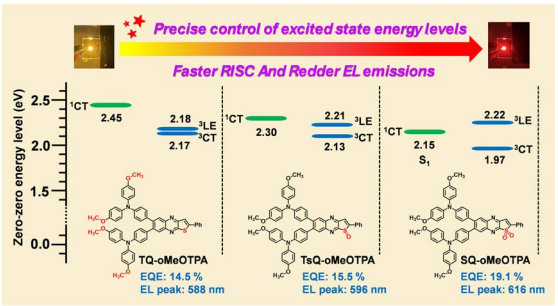
5738



Shape memory and self-healing in a molecular crystal with inverse temperature symmetry breaking

Jiantao Meng, Yuan Su, Hang Zhu and Ting Cai*

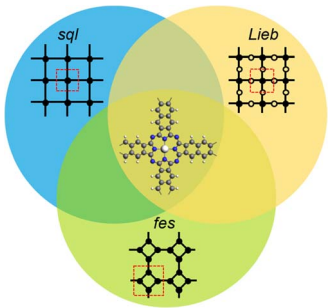
5746



Efficient red thermally activated delayed fluorescence emitters achieved through precise control of excited state energy levels

Bohua Zhang, Siqi Liu, Jiangxue Pei, Meiting Luo, Yi Chen, Qingyu Jia, Zhaoxin Wu and Dongdong Wang*

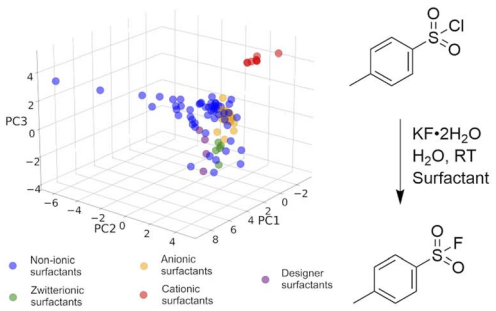
5757



Electronic *Lieb* lattice signatures embedded in two-dimensional polymers with a square lattice

Yingying Zhang, Shuangjie Zhao, Miroslav Položij and Thomas Heine*

5764



Activation of fluoride anion as nucleophile in water with data-guided surfactant selection

Krishna Sharma, Alison McCorry, Samuel Boobier, James Mottram, Rachel Napier, Ian W. Ashworth, A. John Blacker, Nikil Kapur, Stuart L. Warriner, Megan H. Wright and Bao N. Nguyen*

5775

Non-invasive diagnosis of bacterial and non-bacterial inflammations using a dual-enzyme-responsive fluorescent indicator

Yue He, Majun Yang, Jingyi Cui, Can Zhao, Bin Jiang, Jiayun Guan, Xiaobo Zhou, Miao He, Yaya Zhen, Yuxue Zhang, Rongrong Jing, Qi Wang,* Yuling Qin* and Li Wu*