

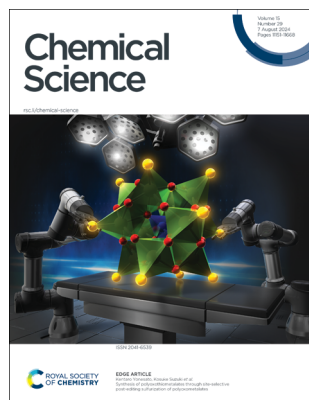
# Chemical Science

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## IN THIS ISSUE

ISSN 2041-6539 CODEN CSHCBM 15(29) 11151–11668 (2024)



### Cover

See Kentaro Yonesato, Kosuke Suzuki *et al.*, pp. 11267–11271. Image reproduced by permission of Kentaro Yonesato and Kosuke Suzuki from *Chem. Sci.*, 2024, **15**, 11267.



### Inside cover

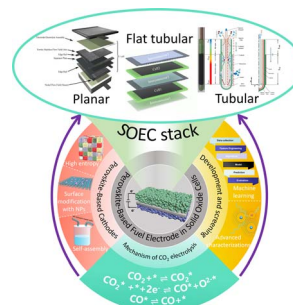
See William C. S. Tai, Wing-Tak Wong, Clarence T. T. Wong *et al.*, pp. 11272–11278. Image reproduced by permission of Clarence T. T. Wong from *Chem. Sci.*, 2024, **15**, 11272.

## PERSPECTIVE

11166

### Advancements and prospects of perovskite-based fuel electrodes in solid oxide cells for CO<sub>2</sub> electrolysis to CO

Ruijia Xu, Shuai Liu, Meiting Yang, Guangming Yang,<sup>\*</sup> Zhixin Luo, Ran Ran, Wei Zhou and Zongping Shao<sup>\*</sup>

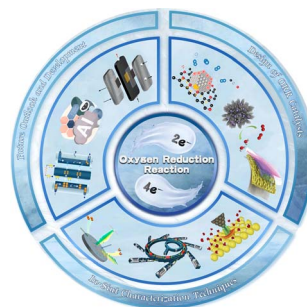


## REVIEWS

11188

### Selective oxygen reduction reaction: mechanism understanding, catalyst design and practical application

Shilong Li, Lei Shi, Yingjie Guo, Jingyang Wang, Di Liu<sup>\*</sup> and Shenlong Zhao<sup>\*</sup>



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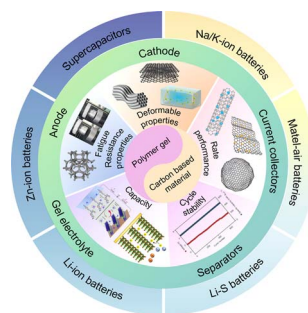
**Fundamental questions  
Elemental answers**

## REVIEWS

11229

## Flexible electrochemical energy storage devices and related applications: recent progress and challenges

Bo-Hao Xiao, Kang Xiao,\* Jian-Xi Li, Can-Fei Xiao, Shunsheng Cao\* and Zhao-Qing Liu\*



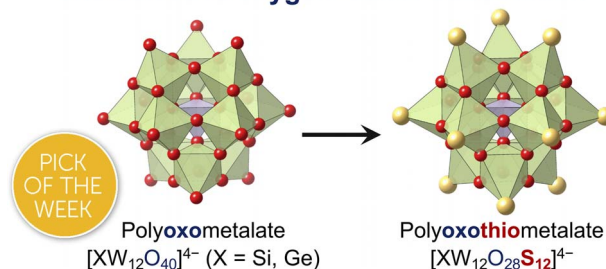
## EDGE ARTICLES

11267

## Synthesis of polyoxothiometalates through site-selective post-editing sulfurization of polyoxometalates

Kentaro Yonesato,\* Kazuya Yamaguchi and Kosuke Suzuki\*

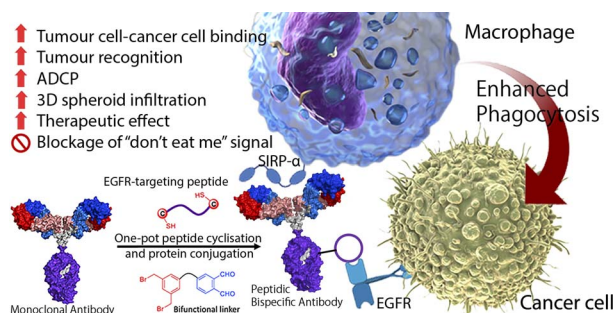
## Site-selective oxygen–sulfur substitution



11272

Macrophage-engaging peptidic bispecific antibodies (pBsAbs) for immunotherapy *via* a facile bioconjugation strategy

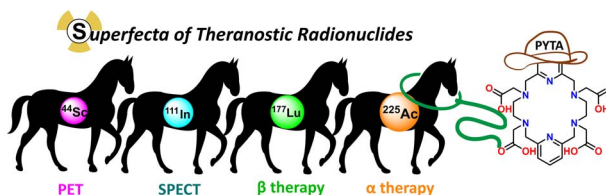
Chihao Shao, Bo Tang, Jacky C. H. Chu, Kwai Man Lau, Wai-Ting Wong, Chi-Ming Che, William C. S. Tai,\* Wing-Tak Wong\* and Clarence T. T. Wong\*



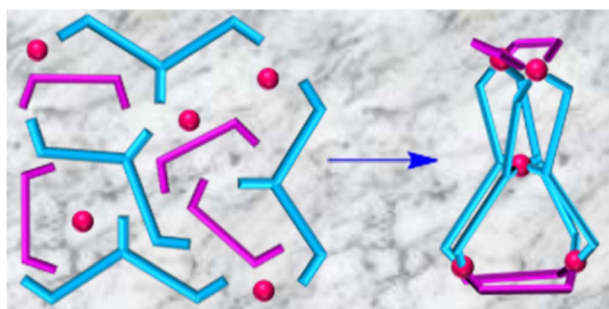
11279

## PYTA: a universal chelator for advancing the theranostic palette of nuclear medicine

Megan E. Simms, Zhiyao Li, Megan M. Sibley, Alexander S. Ivanov, Caroline M. Lara, Timothy C. Johnstone, Vilmos Kertesz, Amanda Fears, Frankie D. White,\* Daniel L. J. Thorek\* and Nikki A. Thiele\*



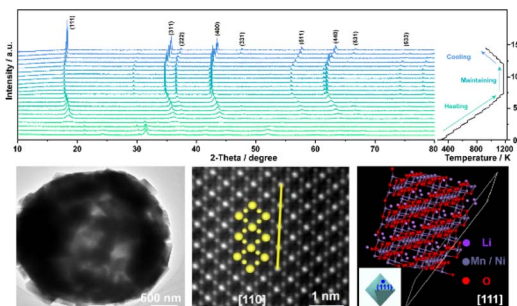
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### A pair of conjoined trinuclear sub-frameworks in a pentanuclear double-cavity discrete coordination cage

Shruti Sharma, Shobhana Krishnaswamy, Soumyakanta Prusty and Dillip Kumar Chand\*

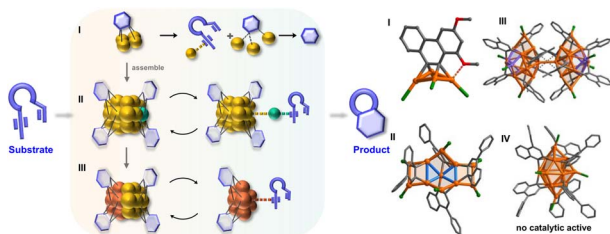
11302



### Kinetically controlled synthesis of low-strain disordered micro-nano high voltage spinel cathodes with exposed {111} facets

Zhi-Qi Li, Yi-Feng Liu, Han-Xiao Liu, Yan-Fang Zhu,\* Jingqiang Wang, Mengke Zhang, Lang Qiu,\* Xiao-Dong Guo, Shu-Lei Chou\* and Yao Xiao\*

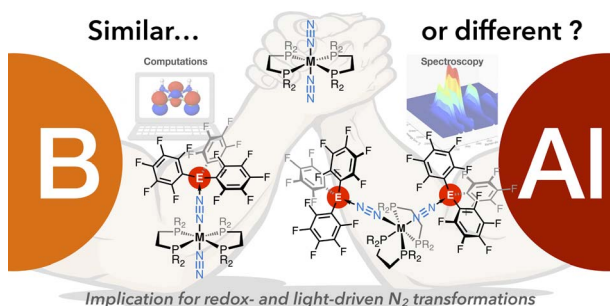
11311



### Divergent catalytic behaviors of assembled organogold(I) clusters derived from enyne cyclization

Qian Liu, Xiao-Yi Zhai, Rui-Jun Jian and Liang Zhao\*

11321



### Coordination of $\text{Al}(\text{C}_6\text{F}_5)_3$ vs. $\text{B}(\text{C}_6\text{F}_5)_3$ on group 6 end-on dinitrogen complexes: chemical and structural divergences

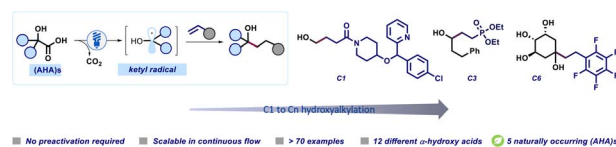
Léon Escomel, Frederico F. Martins, Laure Vendier, Anaïs Coffinet, Nicolas Queyriaux, Vera Krewald\* and Antoine Simonneau\*



11337

### Synthesis of alcohols: streamlined C1 to Cn hydroxyalkylation through photoredox catalysis

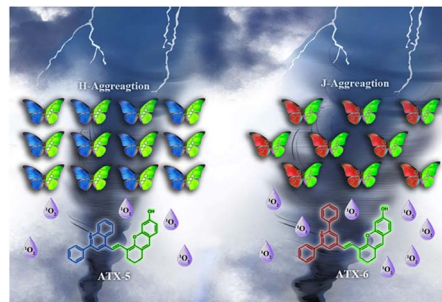
Francesco Pasca, Yuri Gelato, Michael Andresini, Giuseppe Romanazzi, Leonardo Degennaro, Marco Colella\* and Renzo Luisi\*



11347

### Supramolecular engineering cascade regulates NIR-II J-aggregates to improve photodynamic therapy

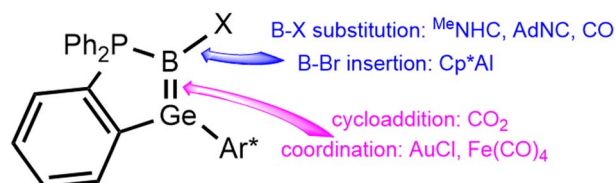
Huizhe Wang, Huijia Liu, Wenqing Li, Shuai Li, Jiaqi Zhang, Jingzhe Zang, Li Liu and Peng Wang\*



11358

### Germaborene reactivity study – addition of carbon nucleophiles, cycloaddition reactions, coordination chemistry

Christian Reik, Lukas W. Jenner, Hartmut Schubert, Klaus Eichele and Lars Wesemann\*



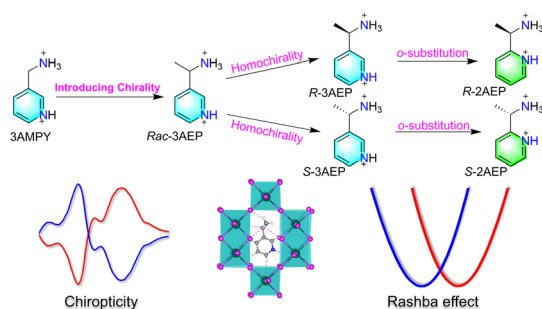
11367

### Blue light emission enhancement and robust pressure resistance of gallium oxide nanocrystals

Zongqing Jin, Pengfei Lv, Yifan Xu, Yongguang Li, Qingfeng Dong, Guanjun Xiao\* and Bo Zou



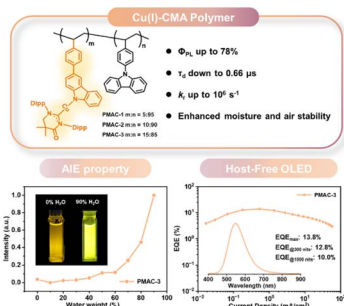
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### Chiral three-dimensional organic–inorganic lead iodide hybrid semiconductors

Chang-Chun Fan, Cheng-Dong Liu, Bei-Dou Liang, Tong-Yu Ju, Wei Wang, Ming-Liang Jin, Chao-Yang Chai and Wen Zhang\*

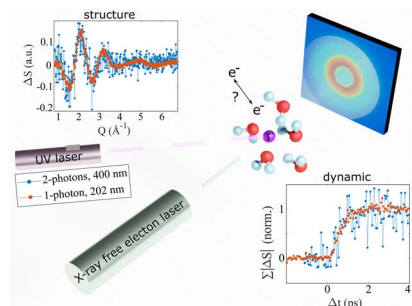
11382



### Luminescent carbene–copper(I)–amide polymers for efficient host-free solution-processed OLEDs

Yao Tan, Ao Ying, Jianlong Xie, Guohua Xie and Shaolong Gong\*

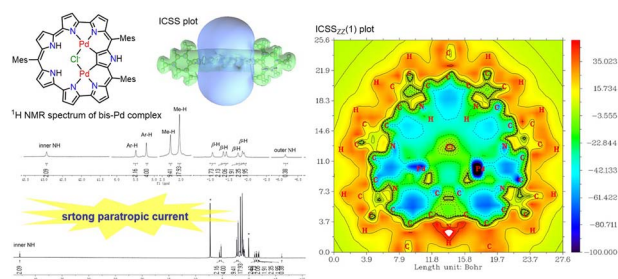
11391



### Real-time structural dynamics of the ultrafast solvation process around photo-excited aqueous halides

Verena Markmann,\* Jaysree Pan, Bianca L. Hansen, Morten L. Haubro, Amke Nimrich, Philipp Lenzen, Matteo Levantino, Tetsuo Katayama, Shin-ichi Adachi, Simone Gorski-Bilke, Friedrich Temps, Asmus O. Dohn, Klaus B. Møller, Martin M. Nielsen and Kristoffer Haldrup

11402



### The unprecedented strong paratropic ring current of a bis-Pd<sup>II</sup> complex of 5,10,23-trimesityl [28] heptaphyrin(1.1.0.0.1.0.0)

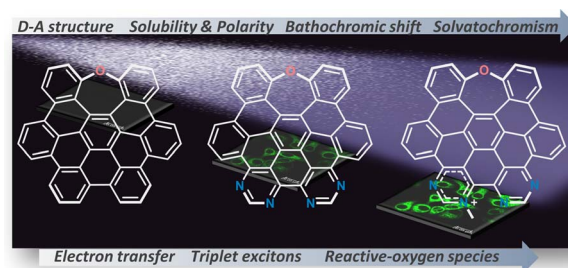
Yang Liu, Ling Xu, Xiaorong Jin, Bangshao Yin, Yutao Rao, Mingbo Zhou, Jianxin Song\* and Atsuhiko Osuka



11408

### Multi-heteroatom doped nanographenes: enhancing photosensitization capacity by forming an electron donor–acceptor architecture

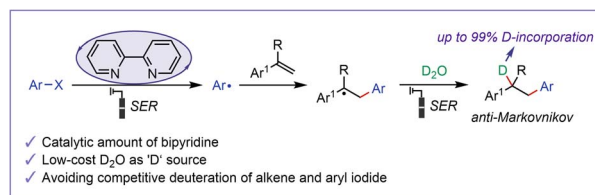
Ranran Li, Bin Ma, Meng Li, Dan Wang, Peng Liu and Peng An\*



11418

### Electroreductive deuteroarylation of alkenes enabled by an organo-mediator

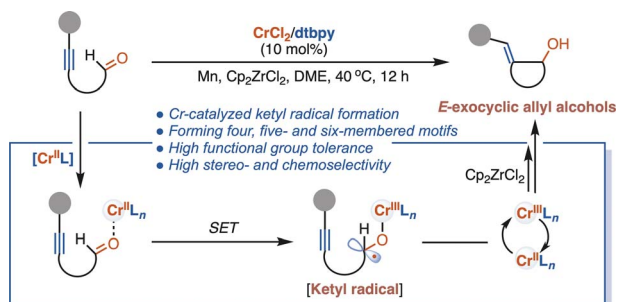
Xinling Li, Jianfeng Zhou, Weijie Deng, Ziliang Wang, Yating Wen, Zhenjie Li, Youai Qiu\* and Yubing Huang\*



11428

### Mild ketyl radical generation and coupling with alkynes enabled by Cr catalysis: stereoselective access to *E*-exocyclic allyl alcohols

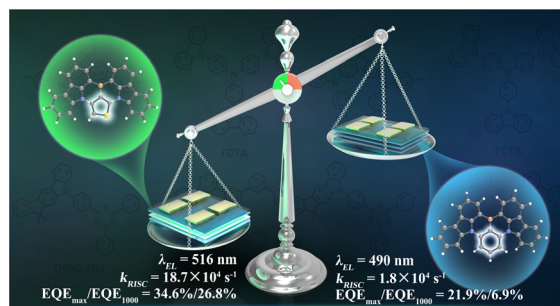
Zheng Luo, Xiaoyu Zhang, Zaiyang Li, Meiming Luo and Xiaoming Zeng\*



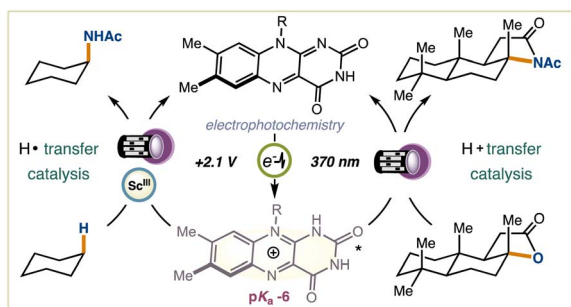
11435

### A multi-resonance emitter with five-membered thiophene as the $\pi$ -core enables efficient, narrowband and reduced efficiency roll-off OLEDs

Linjie Li, Jiaqi Li, Lixiao Guo, Yincui Xu, Yifan Bi, Yexuan Pu, Pingping Zheng, Xian-Kai Chen,\* Yue Wang and Chenglong Li\*



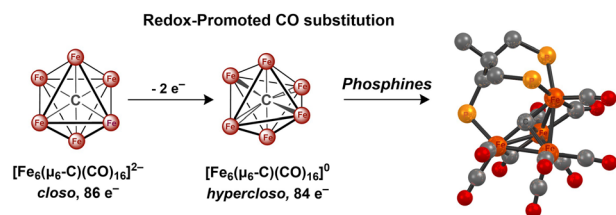
11444



### Unlocking flavin photoacid catalysis through electrophotochemistry

Samuel Gary, Jack Woolley, Sofia Goia and Steven Bloom\*

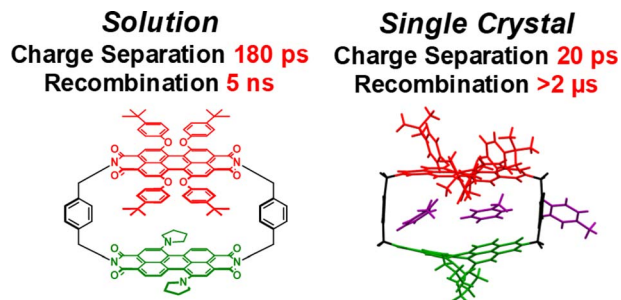
11455



### Multi-phosphine-chelated iron-carbide clusters via redox-promoted ligand exchange on an inert hexa-iron-carbide carbonyl cluster, $[\text{Fe}_6(\mu_6\text{-C})(\mu_2\text{-CO})_4(\text{CO})_{12}]^{2-}$

Caitlyn R. Cobb, Ren K. Ngo, Emily J. Dick, Vincent M. Lynch and Michael J. Rose\*

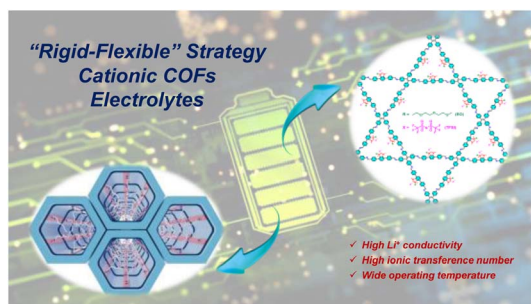
11472



### Structure-enabled long-lived charge separation in single crystals of an asymmetric donor–acceptor perylenediimide cyclophane

Malik L. Williams, Adam F. Coleman, Kathryn R. Peinkofer, Ryan M. Young\* and Michael R. Wasielewski\*

11480



### An integrated "rigid–flexible" strategy by side chain engineering towards high ion-conduction cationic covalent organic framework electrolytes

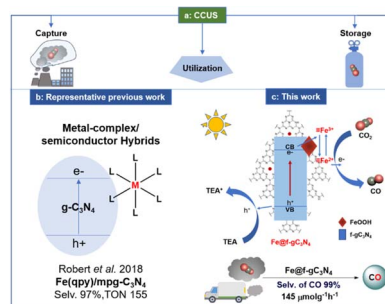
Jian Song, Li Lin, Fengchao Cui, Heng-Guo Wang,\* Yuyang Tian\* and Guangshan Zhu



11488

## A robust Fe-based heterogeneous photocatalyst for the visible-light-mediated selective reduction of an impure CO<sub>2</sub> stream

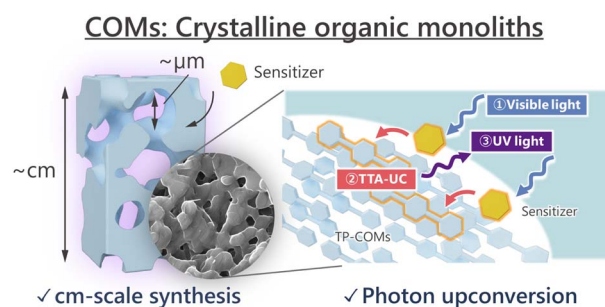
Topi Ghosh, Peng Ren, Philippe Franck, Min Tang, Aleksander Jaworski, Giovanni Barcaro, Susanna Monti, Lata Chouhan, Jabor Rabeah, Alina Skorynina, Joaquin Silvestre-Albero, Laura Simonelli, Anna Rokicińska, Elke Debroye, Piotr Kuśtrowski, Sara Bals and Shoubhik Das\*



11500

## Crystalline organic monoliths with bicontinuous porosity

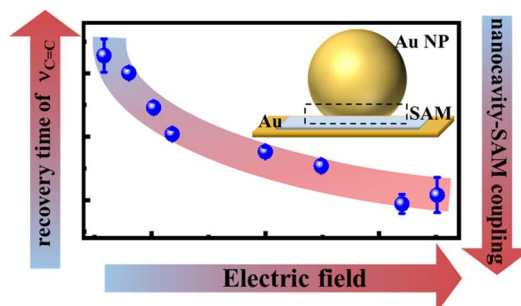
Naoto Matsumoto, Sakura Nakagawa, Kei Morisato, Kazuyoshi Kanamori, Kazuki Nakanishi and Nobuhiro Yanai\*



11507

## Local electric field in nanocavities dictates the vibrational relaxation dynamics of interfacial molecules

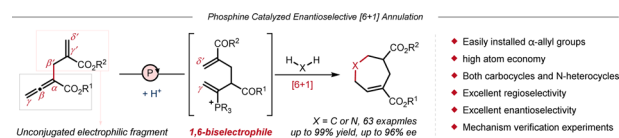
Xiaoxuan Zheng, Quanbing Pei, Junjun Tan,\* Shiyu Bai, Yi Luo\* and Shuji Ye\*



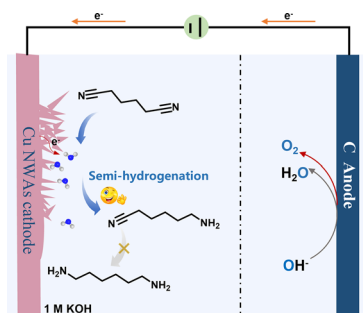
11515

## Enantioselective phosphine-catalyzed [6 + 1] annulations of α-allyl allenates with 1,1-bisnucleophiles

Jingxiong Lai, Wei Cai\* and You Huang\*



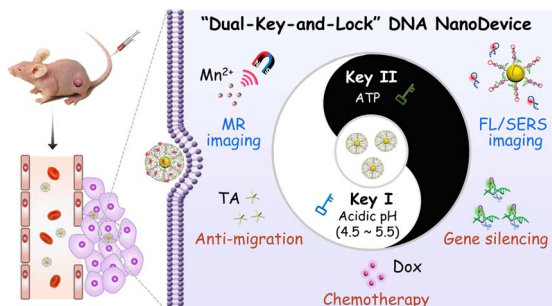
11521



### Electrochemical semi-hydrogenation of adiponitrile over copper nanowires as a key step for the green synthesis of nylon-6

Shutao Wu, Jia Cheng, Yang Xiang, Yunchuan Tu,\*  
Xun Huang\* and Zidong Wei\*

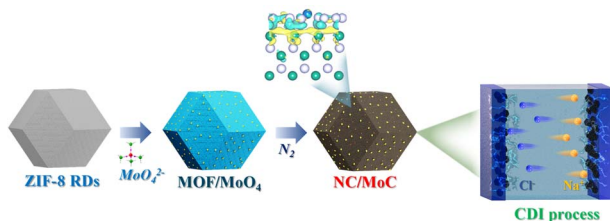
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### A "dual-key-and-lock" DNA nanodevice enables spatially controlled multimodal imaging and combined cancer therapy

Shuzhen Yue, Jiayin Zhan, Xuan Xu, Junpeng Xu,\* Sai Bi\*  
and Jun-Jie Zhu\*

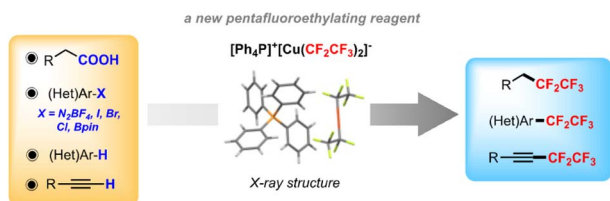
11540



### Nanoarchitectonics of ultrafine molybdenum carbide nanocrystals into three-dimensional nitrogen-doped carbon framework for capacitive deionization

Haolin Li, Shuaihua Zhang,\* Bohan Liu, Xiaoheng Li,  
Ningzhao Shang, Xiaoxian Zhao, Mi haru Eguchi,  
Yusuke Yamauchi\* and Xingtao Xu\*

11550



### Synthesis and application of well-defined [Ph<sub>4</sub>P]<sup>+</sup>[Cu(CF<sub>2</sub>CF<sub>3</sub>)<sub>2</sub>]<sup>-</sup> complex as a versatile pentafluoroethylating reagent

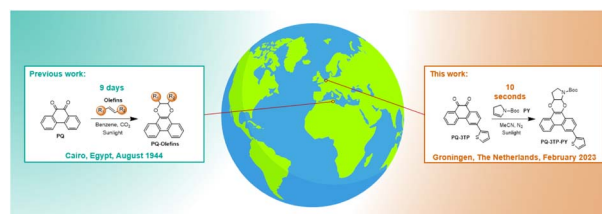
Tao Dong, Qilong Shen\* and Gavin Chit Tsui\*



11557

### With or without a co-solvent? highly efficient ultrafast phenanthrenequinone-electron rich alkene (PQ-ERA) photoclick reactions

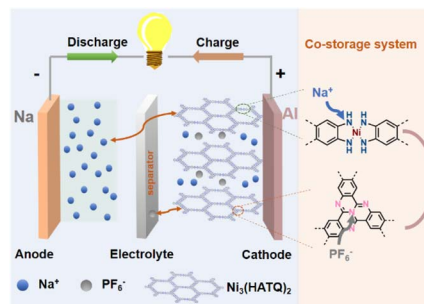
Anna M. Doze, Youxin Fu, Mariangela Di Donato, Michiel F. Hilbers, Gert Luurtsema, Philip H. Elsinga, Wybren Jan Buma, Wiktor Szymanski\* and Ben L. Feringa\*



11564

### A tricycloquinazoline based 2D conjugated metal–organic framework for robust sodium-ion batteries with co-storage of both cations and anions

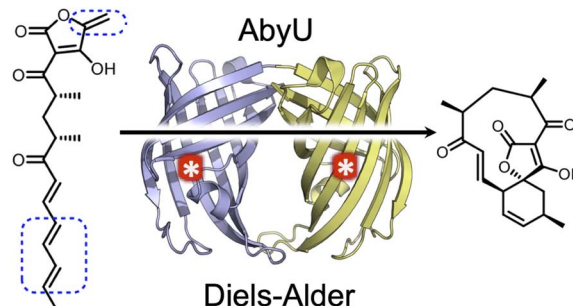
Dan Chen, Linqi Cheng, Weiben Chen, Heng-Guo Wang,\* Fengchao Cui and Long Chen\*



11572

### Delineation of the complete reaction cycle of a natural Diels–Alderase

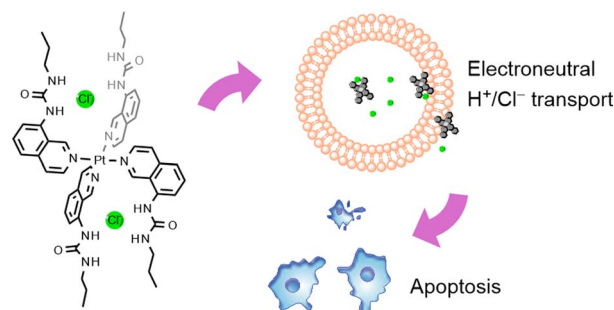
Laurence Maschio, Catherine R. Back, Jawaher Alnawah, James I. Bowen, Samuel T. Johns, Sbusisiwe Z. Mbatha, Li-Chen Han, Nicholas R. Lees, Katja Zorn, James E. M. Stach, Martin A. Hayes, Marc W. van der Kamp, Christopher R. Pudney, Steven G. Burston, Christine L. Willis\* and Paul R. Race\*



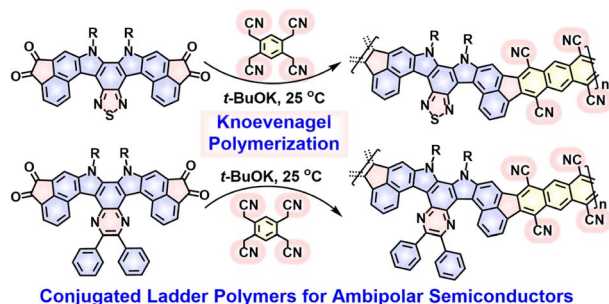
11584

### Platinum-based metal complexes as chloride transporters that trigger apoptosis

Patrick Wang, Mohamed Fares, Radwa A. Eladwy, Deep J. Bhuyan, Xin Wu, William Lewis, Stephen J. Loeb, Lauren K. Macreadie and Philip A. Gale\*



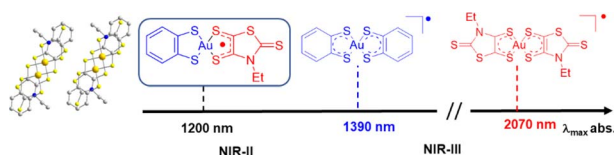
11594



### Ambipolar conjugated ladder polymers by room-temperature Knoevenagel polymerization

Lingli Zhao, Zeng Wu, Hanwen Qin, Guangxiong Bin, Junxiang Gao, Weixuan Zeng,\* Yan Zhao\* and Huajie Chen\*

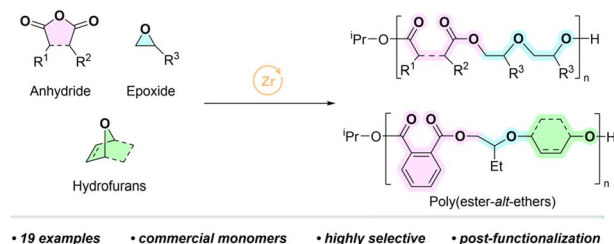
11604



### Mixed-ligand, radical, gold bis(dithiolene) complexes: from single-component conductors to controllable NIR-II absorbers

Haia Kharraz, Pere Alemany, Enric Canadell,\* Yann Le Gal, Thierry Roisnel, Hengbo Cui, Kee Hoon Kim, Marc Fourmigué\* and Dominique Lorcy\*

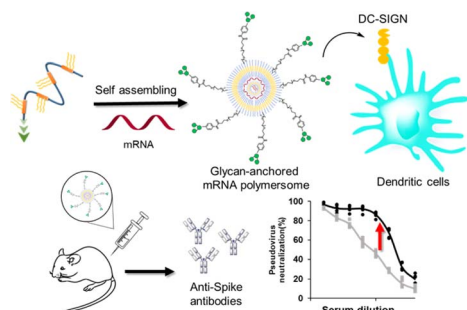
11617



### Cyclic ether and anhydride ring opening copolymerisation delivering new ABB sequences in poly(ester-alt-ethers)

Ryan W. F. Kerr, Alexander R. Craze and Charlotte K. Williams\*

11626



### Synthesis of a dendritic cell-targeted self-assembled polymeric nanoparticle for selective delivery of mRNA vaccines to elicit enhanced immune responses

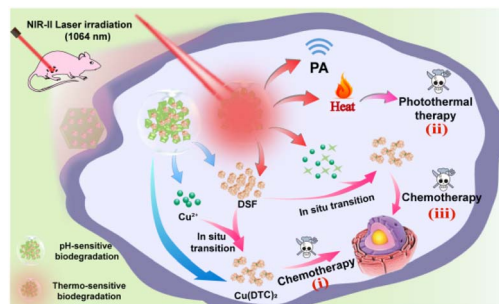
Chen-Yo Fan, Szu-Wen Wang, Cinya Chung, Jia-Yan Chen, Chia-Yen Chang, Yu-Chen Chen, Tsui-Ling Hsu, Ting-Jen R. Cheng and Chi-Huey Wong\*



11633

### Programmable “triple attack” cancer therapy through *in situ* activation of disulfiram toxification combined with phototherapeutics

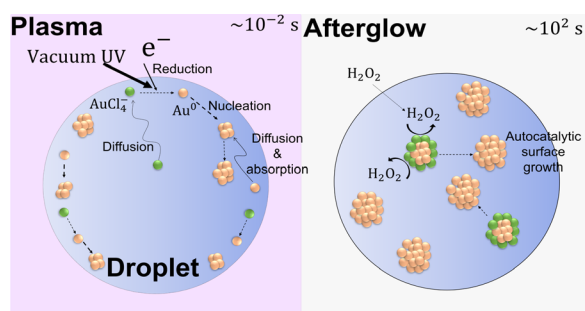
Qiu-Ling He, Ben-Xu Jia, Zhi-Rong Luo, Yu-Kun Wang, Bo Zhang, Tao Liao, Xuan-Yi Guang, Yan-Fang Feng,<sup>\*</sup> Zhen Zhang<sup>\*</sup> and Bo Zhou<sup>\*</sup>



11643

### Mechanisms of controlled stabilizer-free synthesis of gold nanoparticles in liquid aerosol containing plasma

Jae Hyun Nam, Gaurav Nayak, Stephen Exarhos, Chelsea M. Mueller, Dongxuan Xu, George C. Schatz and Peter J. Bruggeman<sup>\*</sup>



11657

### *In situ* bioorthogonal-modulation of m<sup>6</sup>A RNA methylation in macrophages for efficient eradication of intracellular bacteria

Mengyu Sun, Jinsong Ren<sup>\*</sup> and Xiaogang Qu<sup>\*</sup>

