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Cover
See Erwin Reisner *et al.*, pp. 11801–11808. Image reproduced by permission of Lin Su from *Chem. Sci.*, 2025, **16**, 11801. The authors acknowledge the artist Xinyue Hu from August Fireflies Studio for their contribution to the visualisation.

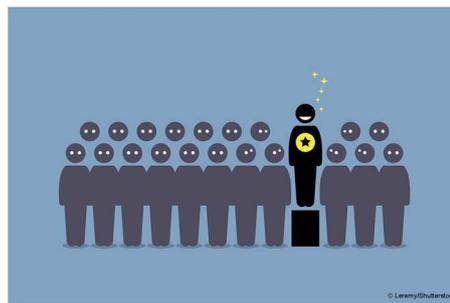


Inside cover
See Zhunzhun Yu, Kuangbiao Liao *et al.*, pp. 11809–11822. Image reproduced by permission of Chonghuan Zhang and Kuangbiao Liao from *Chem. Sci.*, 2025, **16**, 11809.

EDITORIAL

11698

Outstanding Reviewers for *Chemical Science* in 2024

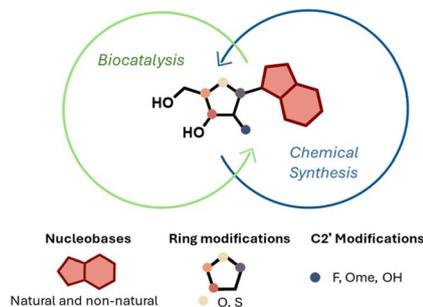


PERSPECTIVE

11700

Preparation of nucleoside analogues: opportunities for innovation at the interface of synthetic chemistry and biocatalysis

Admir Salihovic, Andrea Taladriz-Sender and Glenn A. Burley*



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Fundamental questions
Elemental answers



REVIEWS

11711

Dual-metal synergistic catalysis for promoting electrocatalytic CO₂ reduction

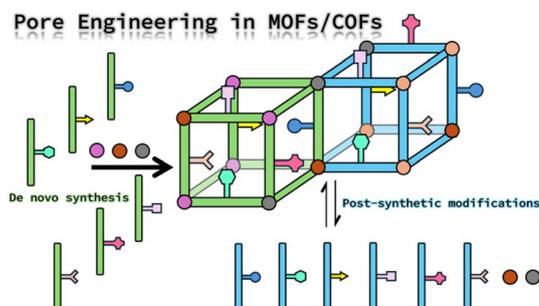
Peng-Yu Shi, Yan Yan, Si-Yuan Yang, Jing-Jing Hao, Mei Wang* and Tong-Bu Lu*



11740

Pore engineering in metal–organic frameworks and covalent organic frameworks: strategies and applications

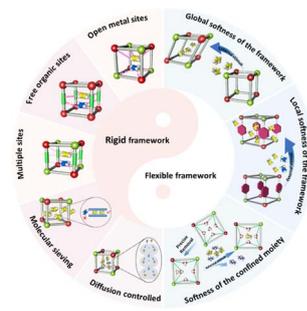
Yanpei Song and Shengqian Ma*



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Oriented design and engineering of advanced metal–organic frameworks for light hydrocarbon separations

Hujun Zhang, Jie Tang, Chunze Yu, Muyu Zhang, Jiaqi Wang and Jingui Duan*

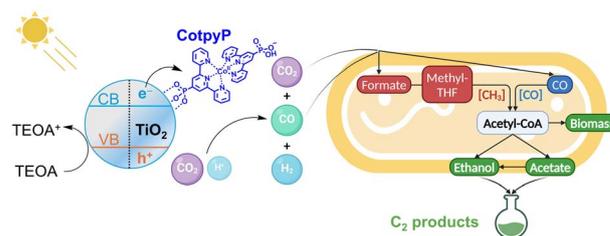


EDGE ARTICLES

11801

Adapting gas fermenting bacteria for light-driven domino valorization of CO₂

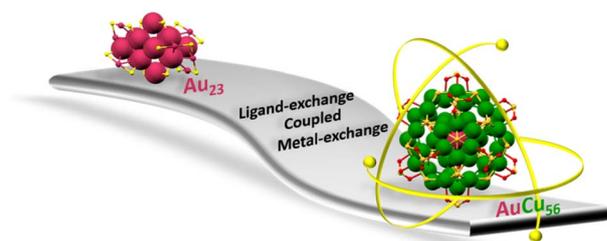
Lin Su, Santiago Rodríguez-Jiménez, Marion I. M. Short and Erwin Reisner*



11849

Identifying the superatomic AuCu₅₆ nanocluster through a ligand-exchange coupled metal-exchange induced transformation

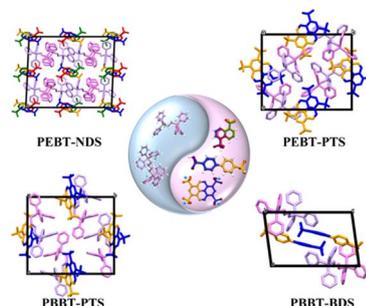
Saniya Gratiou, Bo Li, Dipanjana Mondal, Alok Kumar, Dayona Aleyamma Varghese, Jibin Thomas, De-en Jiang,* Vinayak Kamble and Sukhendu Mandal*



11858

Flexible phosphonium and sulfonate pair-to-pair self-assembled ionic organic single crystals for iodine capture

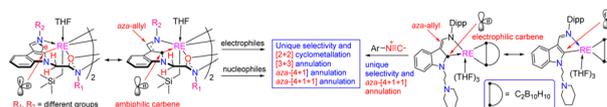
Mingxia Sun, Jia Chen,* Ting Zhang, Wei Xu, Jing He, Yunyun Zhang, Huifeng Liu, Shuang Zhang, Juanjuan Wang, Xin Li, Yali Yang and Hongdeng Qiu*



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Unique selectivity of rare-earth metal ambiphilic carbenes towards organic molecules and novel reactivity patterns with isonitriles

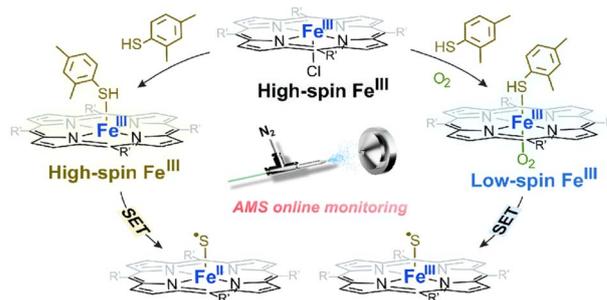
Fuxiang Chai, Weikang Wu, Thayalan Rajeshkumar, Zeming Huang, Qingbing Yuan, Yun Wei, Laurent Maron* and Shaowu Wang*



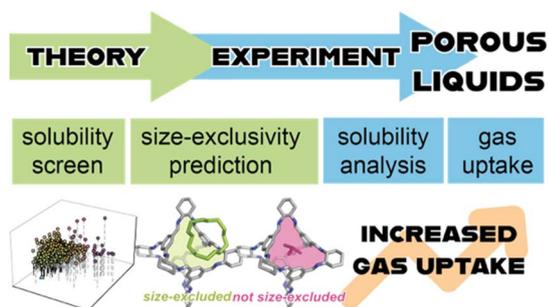
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Revealing axial-ligand-induced switching of spin states for controllable single electron transfer-based radical initiation

Jingyi Qin, Yiyan Yin, Xiaowen Guan, Xiyang Ge, Mengyu Cao, Jin Ouyang and Na Na*



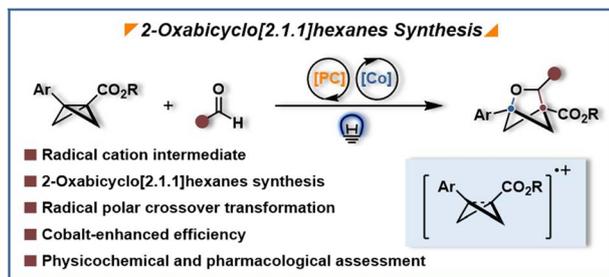
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Predicting pore-carrier solubility and size-exclusivity towards the rational design of type II porous liquid solutions

Austin M. Mroz,^{*} Benjamin D. Egleston, James Sherwood, Ruby C. Morel, Kim E. Jelfs and Rebecca L. Greenaway^{*}

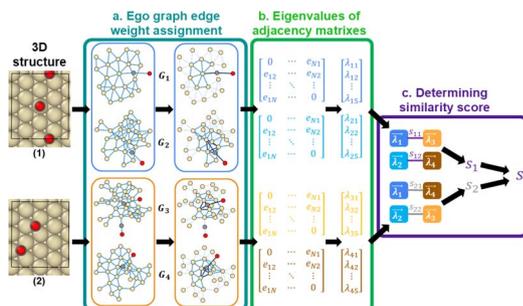
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Photocatalytic synthesis of 2-oxabicyclo[2.1.1]hexanes: cobalt-enhanced efficiency

Si-Yuan Tang, Zhan-Jie Wang, Jin-Jiao Wu, Zhi-Xi Xing, Ze-Yi Du and Huan-Ming Huang^{*}

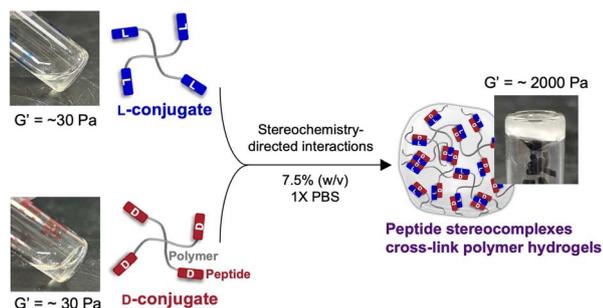
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A structural similarity based data-mining algorithm for modeling multi-reactant heterogeneous catalysts

Jin Zeng, Jiatong Gui and Siddharth Deshpande^{*}

11931



Peptide stereocomplex cross-links for polymer hydrogels

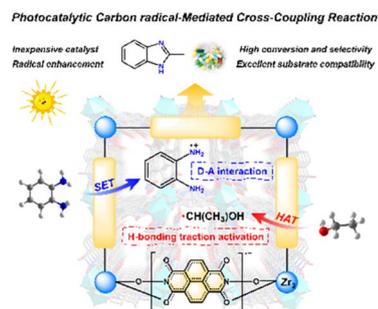
Israt Jahan Duti, Jonathan Paul, Keelin S. Reilly, Darren R. Miller, Diane A. Dickie and Rachel A. Letteri^{*}



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Achieving highly efficient carbon radical-mediated cross-coupling reaction in a confined radical microenvironment within a metal–organic framework

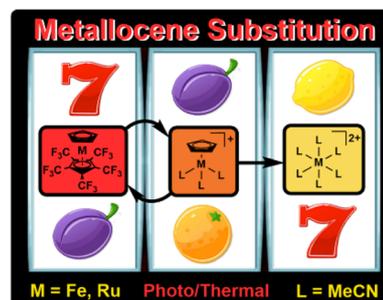
Ying-Lin Li, Ning Li,* Zhi-Bin Mei, Jun-Rong Li, Su-Juan Yao, Fei Yu, Shun-Li Li, Jiao-Min Lin,* Jiang Liu* and Ya-Qian Lan



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Stimulus-responsive metallocenes: a photo/thermal switch enabled by the perfluorinated Cp* ligand

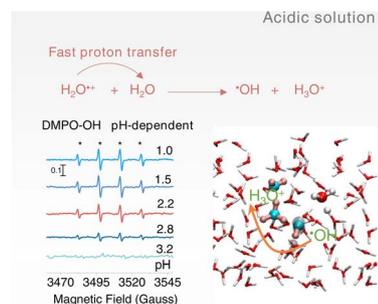
Robin Sievers, Nick Hartmann, Paulin S. Riemann, Tim-Niclas Streit and Moritz Malischewski*



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Radical-mediated proton transfer enables hydroxyl radical formation in charge-delocalized water

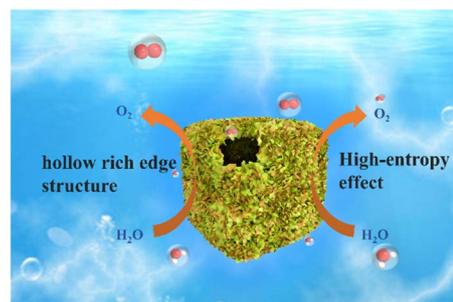
Ruijuan Zhao, Qiuyue Zhang, Na Yang, Lei Li, Zhenyu Li* and Chunhua Cui*



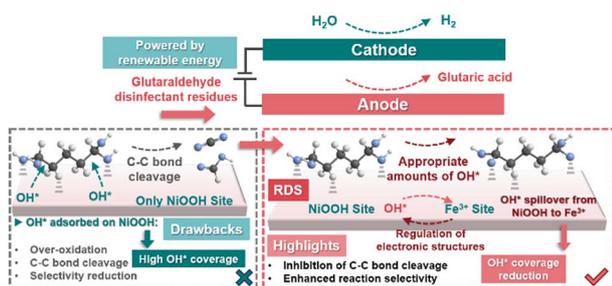
11961

High entropy hydroxide with a hollow nanocage structure promotes efficient and stable water/seawater electro-oxidation

Rui Chang, Yu Pang, Qin Yang, Ruotong Liu, Yu Yang, Yunmei Du, Kang Liu, Zexing Wu, Jianping Lai, Hongdong Li* and Lei Wang*



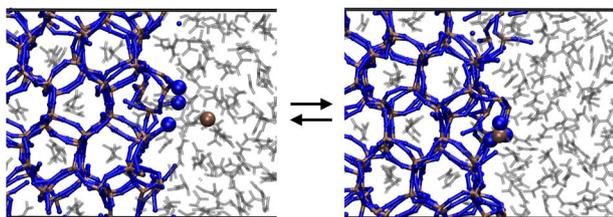
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Industrial electrooxidation of glutaraldehyde waste to glutaric acid via tailoring OH* coverage

Jiani Han, Yaodong Yu, Yingying Wei, G. A. Bagliuk, Jingqi Chi, Jianping Lai* and Lei Wang*

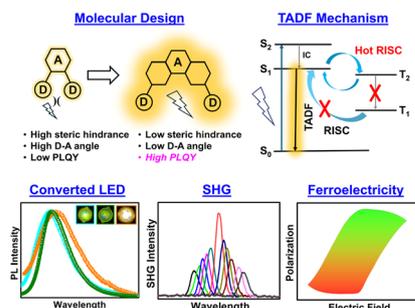
11979



Thermodynamic insights into the self-assembly of zeolitic imidazolate frameworks from computer simulations

Emilio Méndez and Rocío Semino*

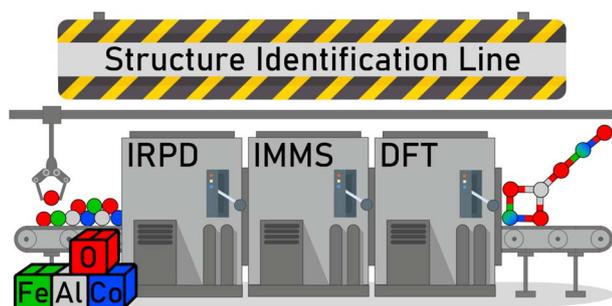
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Steric hindrance modulated efficient thermally activated delayed fluorescence with non-linear optical, ferroelectric and piezoelectric properties

Madhusudan Dutta, Abhijit Chatterjee, Nilotpal Deka, Riteeka Tanwar, Vishnu Mishra, Arindam Saha, Pankaj Mandal,* Ramamoorthy Boomishankar* and Partha Hazra*

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Unexpected structural isomers of $\text{AlFe}_2\text{O}_4^+$ and $\text{AlCo}_2\text{O}_4^+$: vibrational spectroscopy and ion mobility combined with quantum chemistry

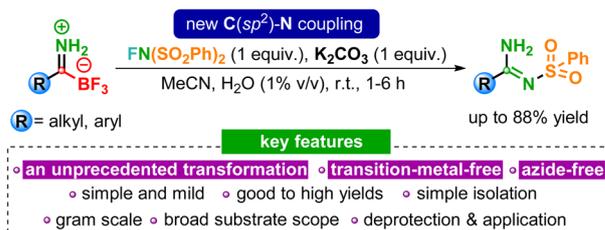
Winni Schwedland, Tatiana C. Penna, Henning Windeck, Fabian Müller, Stephen Leach, Joachim Sauer,* Xavier R. Advincula, Fabian Berger,* Nanako Ishida, Keijiro Ohshimo, Fuminori Misaizu,* Ya-Ke Li, Arghya Chakraborty, Francine Horn and Knut R. Asmis*



12012

Access to amidines via C(sp²)-N coupling of trifluoroborate-iminiums with *N*-fluorobenzenesulfonimide

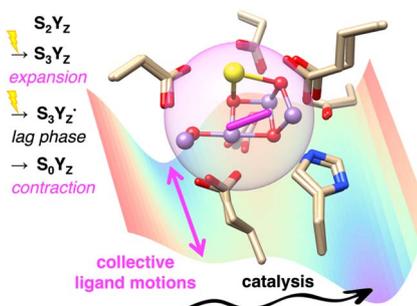
Damijan Knez, Andrej Šterman, Izidor Sosič, Franc Perdih, Gonzalo D. Nuñez, Tilen Knaflič, Denis Arčon, Maria Besora, Jorge J. Carbó, Elena Fernández and Zdenko Časar*



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Collective motions in the primary coordination sphere: a critical functional framework for catalytic activity of the oxygen-evolving complex of photosystem II

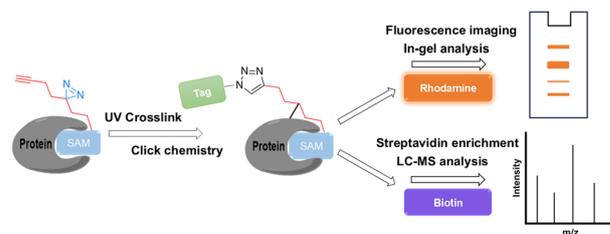
Hiroshi Isobe,* Takayoshi Suzuki, Michihiro Suga, Jian-Ren Shen and Kizashi Yamaguchi



12043

Photoaffinity SAM analogues for the identification of SAM-binding proteins

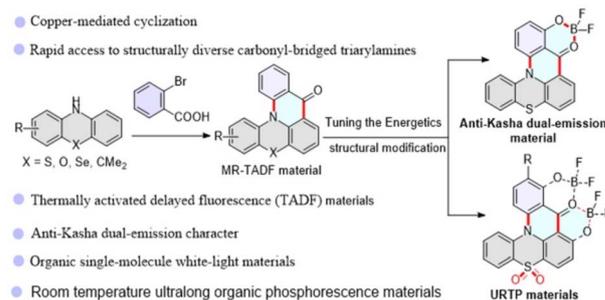
Xiangyu Wu and Min Dong*



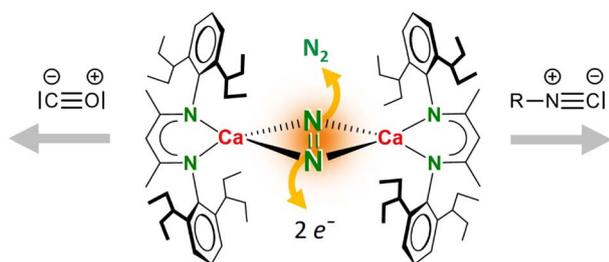
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Tuning the energetics of carbonyl-bridged triarylamines: from thermally activated delayed fluorescence to anti-Kasha dual-emission and room temperature phosphorescence materials

Liquan Wan, Sisi Ling, Lei Yang and Bijun Li*



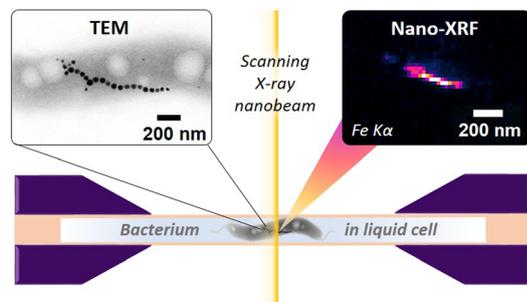
12058



Reductive cyclotrimerization of CO and isocyanides with a highly reactive Ca^I synthon

Stefan Thum, Jonathan Mai, Marcel A. Schmidt, Jens Langer and Sjoerd Harder*

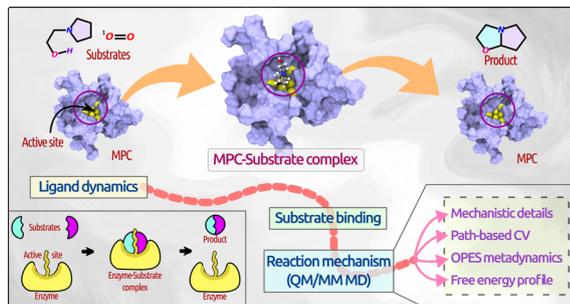
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Imaging biomineralizing bacteria in their native-state with X-ray fluorescence microscopy

Daniel M. Chevrier,* Elisa Cerdá-Doñate, Lucía Gandarias, Miguel A. Gomez-Gonzalez, Sufal Swaraj, Paul E. D. Soto-Rodriguez, Antoine Fraisse, Tom Robinson and Damien Faivre

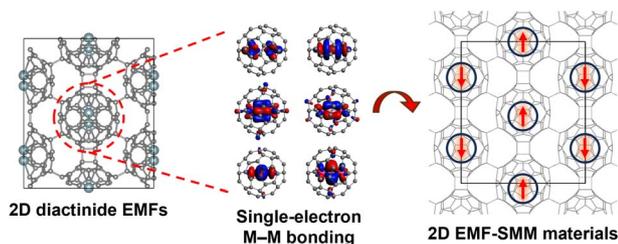
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Modeling catalytic reaction on ligand-protected metal nanoclusters

Vikas Tiwari and Tarak Karmakar*

12087



A design strategy for single-molecule magnet materials with fullerene confinement-induced unpaired f-electrons

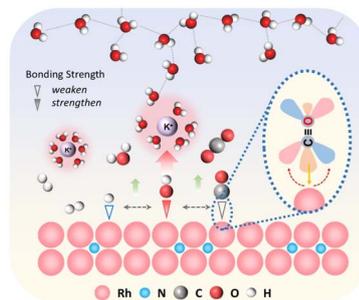
Xiao-Kun Zhao, Jing Zhao, Shi-Ru Wei, Yun-Ze Qiu, Yang He, Han-Shi Hu* and Jun Li*



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Interstitial nitrogen modified Rh nanocrystals for efficient and CO-resistant alkaline hydrogen oxidation electrocatalysis

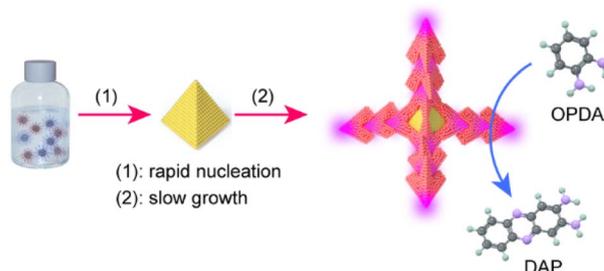
Jianchao Yue, Chaoyi Yang, Yu Zhang, Qianqian Xiong and Wei Luo*



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Precise construction of Pd superstructures with modulated defect properties for solar-driven organic transformation

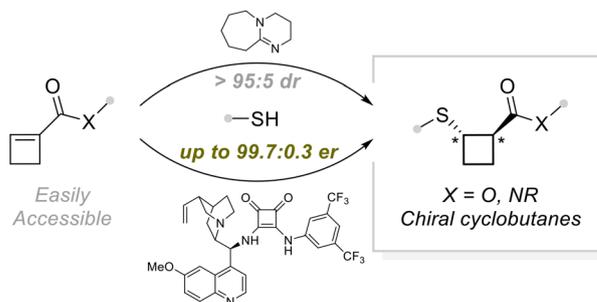
Henglei Jia,* Jingzhao Li, Fu-Kuo Chiang, Hao Wang, Fan Li, Zhong-Qing Lin, Qifeng Ruan* and Chun-yang Zhang*



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Enantioselective synthesis of 1,2-disubstituted thiocyclobutanes via Michael addition

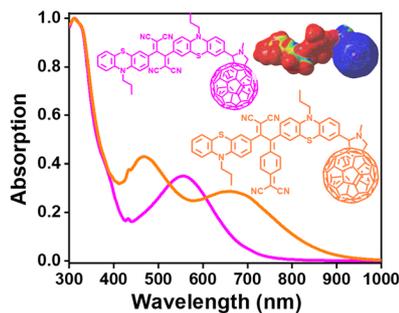
Emma G. L. Robert and Jerome Waser*



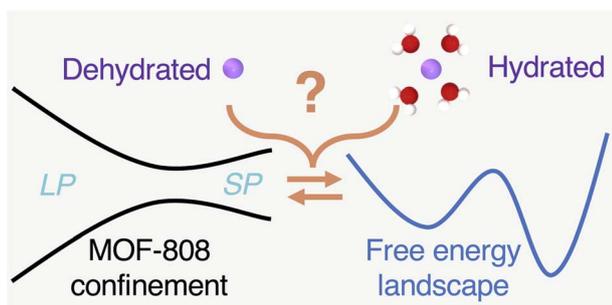
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Strong acceptor incorporated phenothiazine-C₆₀ multi-redox push-pull conjugates: demonstration of C₆₀'s superior electron acceptor characteristics

Pankaj K. Gupta, Chamari V. Ileperuma, Rajneesh Misra* and Francis D'Souza*



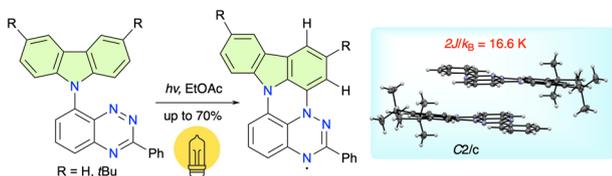
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Thermodynamics of alkali metal ion uptake from aqueous solution in MOF-808

Yuanhui Pan, Suman Saha, Matthew Burigana, Vivek Singh, Omar M. Yaghi and Francesco Paesani*

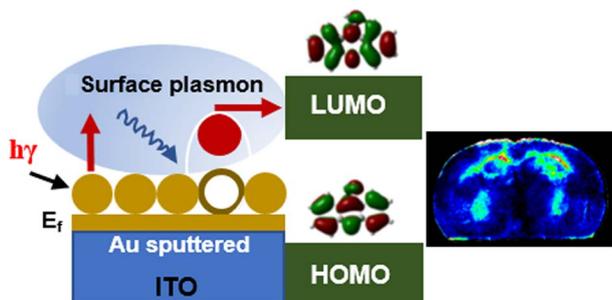
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Photochemical synthesis of carbazole-fused Blatter radicals: effective spin injection to the carbazole system

Paulina Bartos,* Patrycja Szamweber, Bruno Camargo, Anna Pietrzak and Piotr Kaszyński*

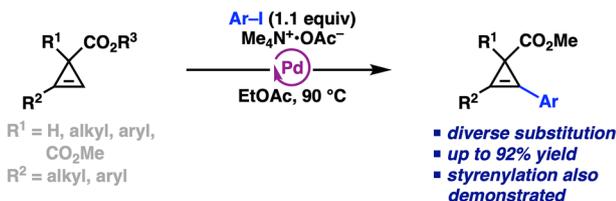
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Mass spectrometric imaging of organic and metallic metabolites by plasmon-induced interfacial charge-transfer transition (PICTT) on Au sputtered ITO slides

Shao Chang, Xin Zhou, Anji Gao, Yixiang Luo, Yujia Shan, Lin Zhang, Zhengwei Gui, Xingchen Huang, Xiaoyuan Hu, Tianci Huo, Linhui Liu and Hongying Zhong*

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General palladium-catalyzed cross coupling of cyclopropenyl esters

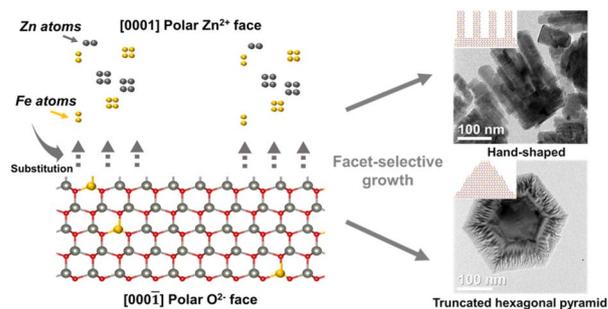
Zachary P. Sercel and Ilan Marek*



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Iron-assisted growth of anisotropic ZnO nanostructures

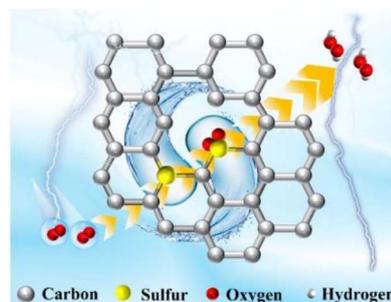
Zhengxi Xuan, Avisek Dutta, Shuo Liu, Yueling Qin, Kaiwen Chen, Zheng Fu, Paras N. Prasad, Chaochao Dun* and Mark T. Swihart*



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Metal-free sulfur-doped reduced graphene oxide electrocatalysts for promising production of hydrogen peroxide: construction and identification of active sites

Sifan Li, Shiwen Du, Jiansheng Li,* Wenjun Fan, Yang Yang, Peng Zhao, Haotian Zhu, Wansheng You, Xiaojing Sang* and Fuxiang Zhang*



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Strain-release driven spirocyclization of bicyclo [1.1.0]butanes: access to 6,7-diazaspiro[3.4]octanes

Qin Jiang, Jianyang Dong,* Fang Lei, Dejiang Yu, Ting Li, Huaming Sun and Dong Xue*

