

# Journal of Materials Chemistry C

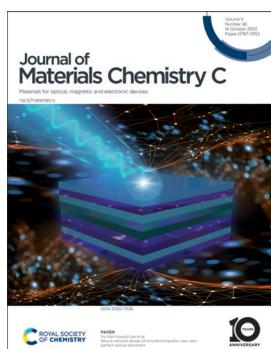
Materials for optical, magnetic and electronic devices

[rsc.li/materials-c](https://rsc.li/materials-c)

*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 2050-7526 CODEN JMCCCX 11(38) 12787–13152 (2023)



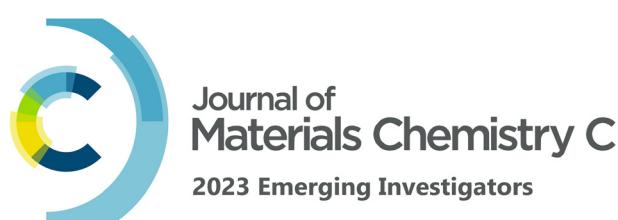
### Cover

See Ho Wai Howard Lee  
et al., pp. 12906–12914.  
Image reproduced  
by permission of  
Ho Wai Howard Lee  
from *J. Mater. Chem. C*,  
2023, 11, 12906.

## PROFILE

12799

Contributors to the Emerging Investigators 2023  
issue

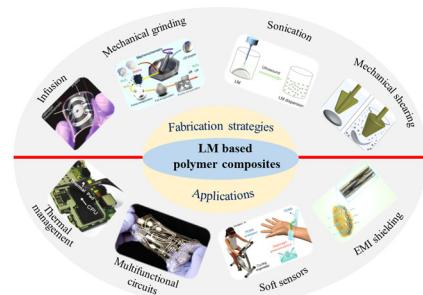


## REVIEWS

12807

**A review on thermal and electrical behaviours of liquid metal-based polymer composites**

Li-Chuan Jia, Yun-Fei Yue, Jian-Feng Zeng,  
Zhi-Xing Wang, Run-Pan Nie,\* Ling Xu,  
Ding-Xiang Yan\* and Zhong-Ming Li



**Editorial Staff****Executive Editor**

Michaela Mühlberg

**Deputy Editor**

Geraldine Hay

**Editorial Production Manager**

Jonathon Watson

**Senior Publishing Editor**

Fiona Iddon

**Development Editor**

Rose Wedgbury

**Publishing Editors**

Matthew Blow, Sam Howell, Evie Karkera, Carole Martin, Kirsty McRoberts

**Editorial Assistant**

Daniel Smith

**Publishing Assistant**

Jane Paterson

**Publisher**

Sam Keltie

For queries about submitted papers, please contact  
Jonathon Watson, Editorial Production Manager  
in the first instance. E-mail: [materialsC@rsc.org](mailto:materialsC@rsc.org)

For pre-submission queries please contact  
Michaela Mühlberg, Executive Editor.  
E-mail: [materialsC@rsc.org](mailto:materialsC@rsc.org)

Journal of Materials Chemistry C (electronic: ISSN 2050-7534) is published 48 times a year by the Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, UK CB4 0WF.

All orders, with cheques made payable to the Royal Society of Chemistry, should be sent to the 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](mailto:orders@rsc.org)

2023 Annual (electronic) subscription price: £2521; \$4046. Customers in Canada will be subject to a surcharge to cover GST. Customers in the EU subscribing to the electronic version only will be charged VAT.

If you take an institutional subscription to any Royal Society of Chemistry journal you are entitled to free, site-wide web access to that journal. You can arrange access via Internet Protocol (IP) address at [www.rsc.org/ip](http://www.rsc.org/ip)

Customers should make payments by cheque in sterling payable on a UK clearing bank or in US dollars payable on a US clearing bank.

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](mailto:advertising@rsc.org)

For marketing opportunities relating to this journal, contact [marketing@rsc.org](mailto:marketing@rsc.org)

# Journal of Materials Chemistry C

[rsc.li/materials-C](http://rsc.li/materials-C)

*Journal of Materials Chemistry A, B & C* cover high quality studies across all fields of materials chemistry. The journals focus on those theoretical or experimental studies that report new understanding, applications, properties and synthesis of materials. *Journal of Materials Chemistry C* covers materials with applications in optical, magnetic and electronic devices.

## Editorial Board

**Editor-in-Chief**

Natalie Stimpel, Georgia Institute of Technology, USA

**Associate Editors**

A. S. Achalkumar, Indian Institute of Technology, India

Rachel Crespo-Otero, University College London, UK

Renaud Demadrille, Interdisciplinary Research Institute of Grenoble, France

Antonio Facchetti, Northwestern University, USA

Unjung Jeong, POSTECH, South Korea

Oana Jurchescu, Wake Forest University, USA  
Mingzhu Li, Chinese Academy of Sciences, China

Martyn McLachlan, Imperial College London, UK

Kasper Moth-Poulsen, Chalmers University of Technology, Sweden

Ana Nogueira, University of Campinas, Brazil

Erin Ratcliff, University of Arizona, USA

Federico Rosei, University of Trieste, Italy

Yana Vaynzof, Technical University of Dresden, Germany

Maia Vergniory, Max Planck Institute for

Chemical Physics of Solids, Germany  
Ni Zhao, Chinese University of Hong Kong, Hong Kong

Zhiguo Xia, South China University of Technology, China

Hao-Li Zhang, Lanzhou University, China

## Advisory Board

C. Bai, Chinese Academy of Sciences, China

E. Bittner, University of Houston, USA

T. Bunning, Air Force Research Laboratory, USA

J. Casado, University of Malaga, Spain

R. Chandrasekar, University of Hyderabad, India

Y-J. Cheng, National Chiao Yung University, Taiwan

M. Chhowalla, Rutgers - The State University of New Jersey, USA

C. Chi, National University of Singapore, Singapore

L. Chua, National University of Singapore, Singapore

D. Evans, Beijing University of Chemical Technology, China

M. Green, King's College London, UK

E. von Hauf, VU Amsterdam, Netherlands

L. Hueso, CIC nanoGUNE, Spain

C. S. Hwang, Seoul National University, Korea

M. Kanatzidis, Northwestern University, USA

T. Kato, The University of Tokyo, Japan

J. Kido, Yamagata University, Japan

H. Kuang, Jiangnan University, China

T. Kusamoto, Institute for Molecular Science, Japan

M. Jeffries-EL, Boston University, USA

M. Lira-Cantú, Catalan Institute of Nanoscience and Nanotechnology, Spain

S. Marder, University of Colorado Boulder, USA

I. McCulloch, University of Oxford, UK

H. Mori, University of Tokyo, Japan

J. Ouyang, National University of Singapore, Singapore

N. Robertson, University of Edinburgh, UK

P. Samori, Université de Strasbourg, France

R. Seshadri, University of California, Santa Barbara, USA

R. Sessoli, University of Florence, Italy

Z. Shuai, Tsinghua University, China

C. Silva, Georgia Institute of Technology, USA

J. Snyder, Northwestern University, Illinois, USA

C. Weder, University of Fribourg, Switzerland

G. Welch, University of Calgary, Canada

W. Wong, Hong Kong Polytechnic University, Hong Kong

P. Woodward, Ohio State University, USA

Y. Yin, UC Riverside, USA

A. Zayats, King's College London, UK

X. Zhan, Peking University, China

Q. Zhang, City University of Hong Kong, Hong Kong

## Information for Authors

Full details on how to submit material for publication in *Journal of Materials Chemistry C* 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/materials-C](http://rsc.li/materials-C). Submissions: The journal welcomes submissions of manuscripts for publication as Full Papers, Communications, Reviews, Highlights and Applications. Full Papers and Communications should describe original work of high quality and impact which must highlight the novel properties or applications (or potential properties/applications) of the materials studied.

Additional details are available from the Editorial Office or <http://www.rsc.org/authors>

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

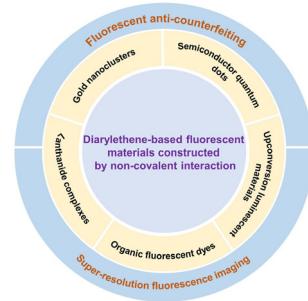


## REVIEWS

12828

**Photochromic diarylethene induced fluorescence switching materials constructed by non-covalent interactions**

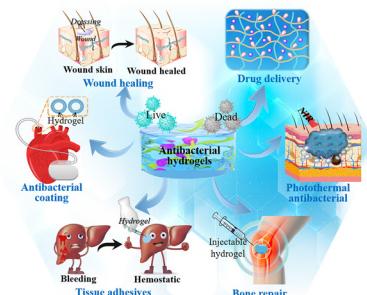
Qing-Feng Li, Longlong Zhang, Mengdan Shen, Jin-Tao Wang,\* Lin Jin\* and Zhenling Wang\*



12848

**Recent progress of antibacterial hydrogel materials for biomedical applications**

Qian Wang, Xing Feng, Hong Xu, Guo Guo, Ying Li\* and Qilong Zhang\*

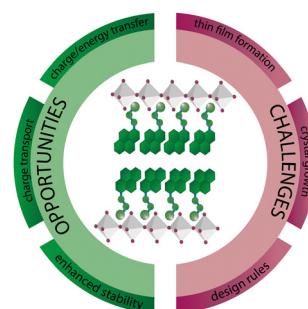


## PERSPECTIVE

12877

**2D and quasi-2D hybrid perovskites containing organic cations with an extended conjugated system: opportunities and challenges**

Wouter T. M. Van Gompel,\* Laurence Lutsen and Dirk Vanderzande

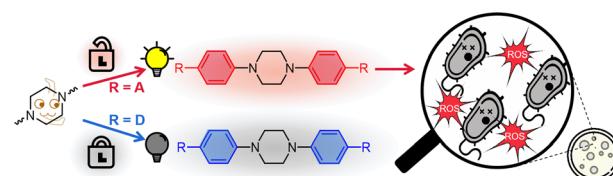


## COMMUNICATIONS

12894

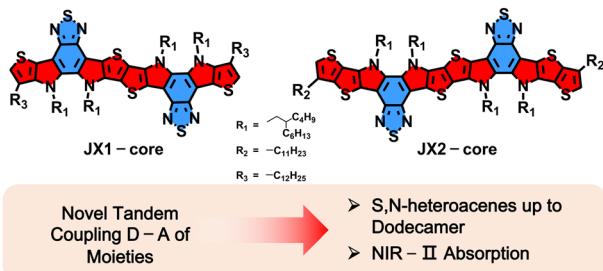
**Piperazine: a promising building block for aggregation-induced emission materials**

Tuokai Peng and Hui-Qing Peng\*



## COMMUNICATIONS

12900

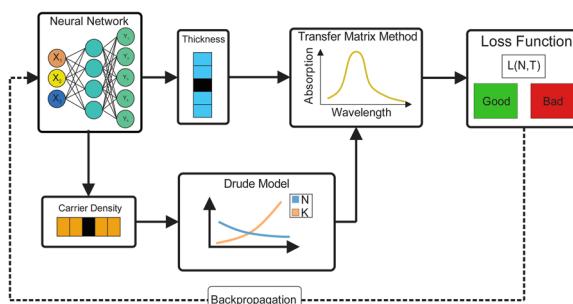


**A narrow-bandgap non-fullerene acceptor constructed with an S,N-heteroacene up to a dodecamer in size**

Jiaxin Guo, Xinyuan Jia, Xiangjian Cao, Tengfei He, Huazhe Liang, Wendi Shi, Zheng Xu, Ruohan Wang, Yaxiao Guo,\* Zhaoyang Yao,\* Xiangjian Wan, Guankui Long, Chenxi Li and Yongsheng Chen\*

## PAPERS

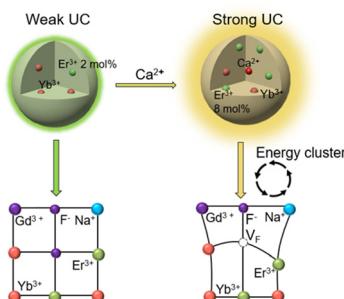
12906



**Neural network design of broadband epsilon near zero perfect optical absorbers**

David Dang, Aleksei Anopchenko, Sudip Gurung, Zoey Liu, Xuguo Zhou and Ho Wai Howard Lee\*

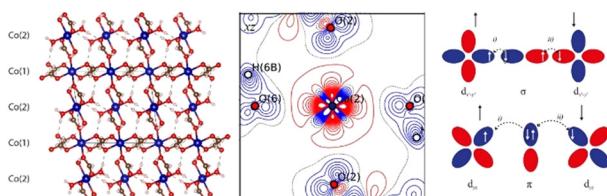
12915



**Enhancing upconversion via constructing local energy clusters in lanthanide-doped fluoride nanoparticles**

Haolin Yang, Anshuo Zhang, Hai Guo,\* Denghao Li, Shiqing Xu\* and Lei Lei\*

12922



**Elucidating the superexchange mechanisms in magnetic coordination polymer  $[\text{Co}(\text{HCOO})_2(\text{H}_2\text{O})_2]_\infty$  through chemical bonding analysis**

Thomas Bjørn Egede Grønbech, Lennard Krause, Davide Ceresoli\* and Bo Brummerstedt Iversen\*

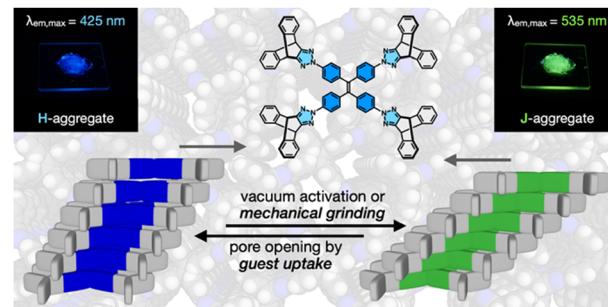


## PAPERS

12933

**A hydrogen-bonded organic framework of rigidly branched fluorophore: guest-adaptive cavity and phase-dependent light emission**

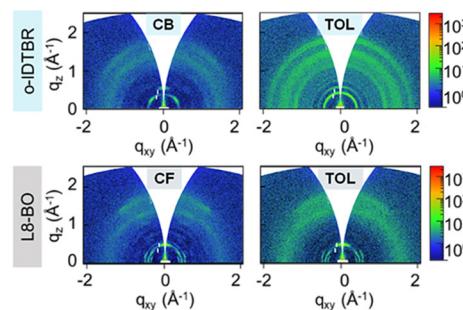
Hongsik Kim, Hyejin Yoo, Jin Yeong Kim and Dongwhan Lee\*



12941

**Boosting electron transport in non-fullerene acceptors using non-chlorinated solvents**

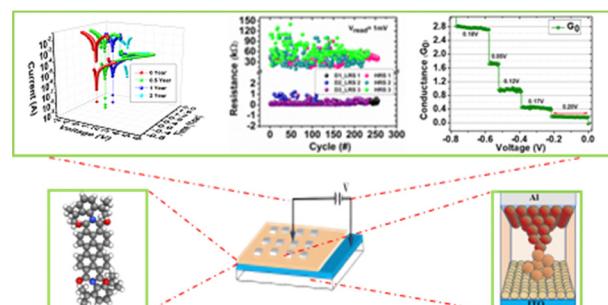
Mohamad Insan Nugraha,\* Ryanda Enggar Anugrah Ardhi, Dipti Naphade, Weimin Zhang, Youyou Yuan, Martin Heeney and Thomas D. Anthopoulos\*



12949

**Two-stage filamentary mechanism in high-performance organic resistive switches**

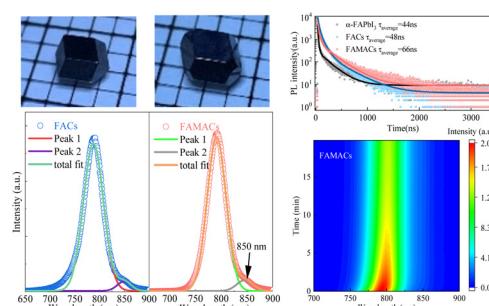
Arti Bisht, Nitish Saini, Komal Bhardwaj, Rachana Kumar and Ajeet Kumar\*



12959

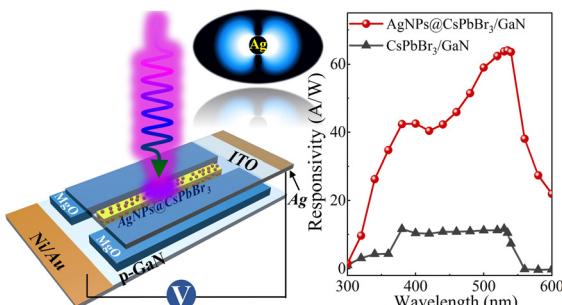
**Synergistic enhancement of the optoelectronic performance and stability of MA and Cs in  $\text{FA}_x\text{MA}_y\text{Cs}_{1-x-y}\text{PbI}_z\text{Br}_{3-z}$  single crystals**

Kaiyu Wang, Feitong Chen, Qing Yao, Jie Zhang, Huiling Zhu, Weiwei Zhang, Xiaoyuan Zhan, Shenglai Wang\* and Jianxu Ding\*



## PAPERS

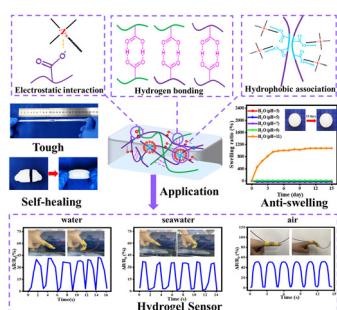
12968



**Plasmon-enhanced photoresponse and stability of a  $\text{CsPbBr}_3$  microwire/GaN heterojunction photodetector with surface-modified Ag nanoparticles**

Chengxin Lin, Peng Wan, Bingwang Yang, Daning Shi, Caixia Kan\* and Mingming Jiang\*

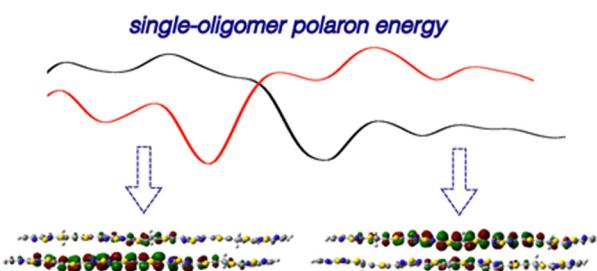
12981



**Anti-swelling hydrogels based on surfactant–polymer interactions for underwater sensing with excellent mechanical properties**

Yue Cai, Kaizhen Wan, Qihui Chen, Maochun Hong, Zhao-Xi Zhou\* and Heqing Fu\*

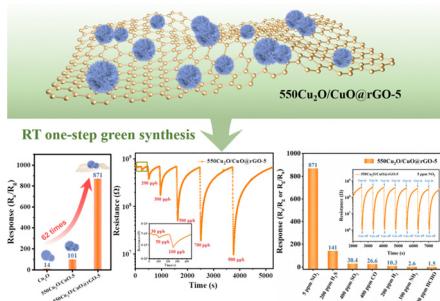
12992



**Dynamics-induced charge transfer in semiconducting conjugated polymers**

Fabian Bauch, Chuan-Ding Dong\* and Stefan Schumacher

12999



**One-step green synthesis of  $\text{Cu}_2\text{O}/\text{CuO}@\text{rGO}$  composites for ppt level detection of  $\text{NO}_2$  at room temperature**

Jinjuan Li, Jing Hu,\* Nan Li, Miao Cheng, Tao Wei, Qianqian Liu, Ruirui Wang, Wanfei Li, Yun Ling, Yafei Zhang and Bo Liu\*



## PAPERS

13010

**Simultaneous improvement in efficiency and photostability of organic solar cells by modifying the ZnO electron-transport layer with curcumin**

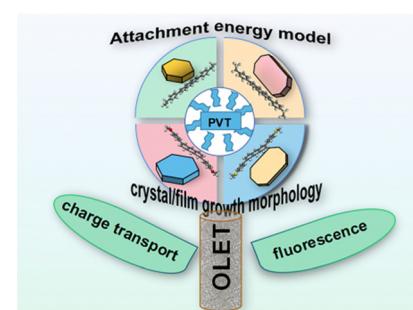
Yue Liu, Hang Yang, Yue Wu, Hongyu Fan, Xiaoxiao Li, Kewei Hu, Chaohua Cui\* and Yongfang Li



13018

**The effect of heteroatoms at end groups of anthracene derivatives on the photoelectric properties and crystal/film morphology: a theoretical perspective**

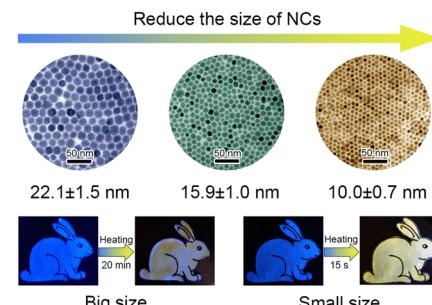
Gui-Ya Qin, Xiao-Qi Sun, Pan-Pan Lin, Xue Wei, Jing-Fu Guo, Wei-Bo Cui, Jian-Xun Fan, Hui Li, Lu-Yi Zou and Ai-min Ren\*



13030

**Phase transition and rapid temperature response of lead-free perovskite Cs–Cu–I nanocrystals enabled by their size**

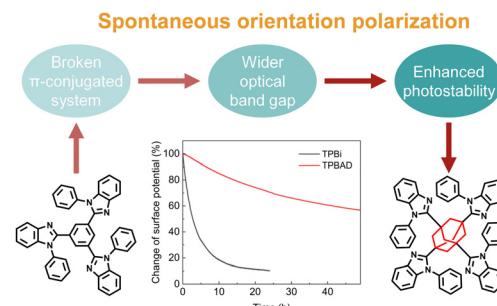
Jie Chen, Yu Li, Zhe Yin,\* Shuaibing Wang, Ouyang Lin, Wentao Niu, Feng Teng\* and Aiwei Tang\*



13039

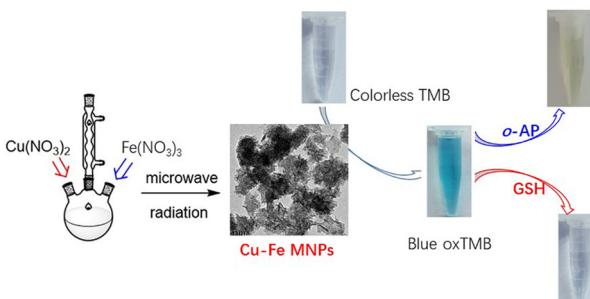
**Stable spontaneous orientation polarization by widening the optical band gap with 1,3,5,7-tetrakis(1-phenyl-1*H*-benzo[*d*]imidazol-2-yl)-adamantane**

Wei-Chih Wang, Kyohei Nakano, Yuya Tanaka, Keisuke Kurihara, Hisao Ishii, Kiyohiro Adachi, Daisuke Hashizume, Chain-Shu Hsu\* and Keisuke Tajima\*



## PAPERS

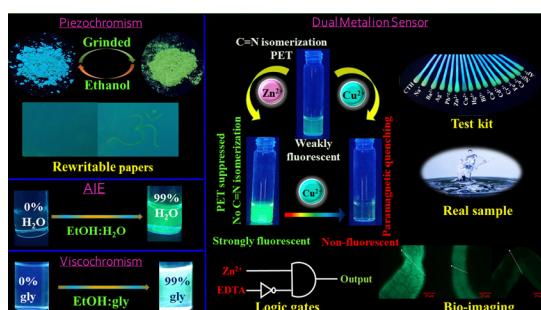
13047



**Peroxidase-like Cu–Fe bimetal oxide mesoporous nanospheres identified for the efficient recognition of toxic o-aminophenol and bioactive glutathione**

Xuemei Zhou, Lingmin Kong, Junkai Hao, Jing Feng, Shuo Sun, Chuanzhen Zhou, Yanmin Liu, Zhengquan Yan,\* Xiao Zhu and Lei Hu\*

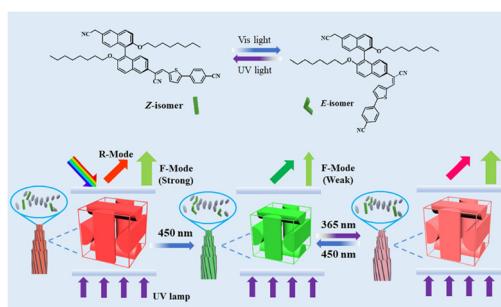
13056



**A multifunctional coumarin-based probe for distinguishable detection of  $\text{Cu}^{2+}$  and  $\text{Zn}^{2+}$ : its piezochromic, viscochromic and AIE behavior with real sample analysis and bio-imaging applications**

Aayoosh Singh, Pranjalee Yadav, Saumya Singh, Pradeep Kumar, S. Srikrishna and Vinod P. Singh\*

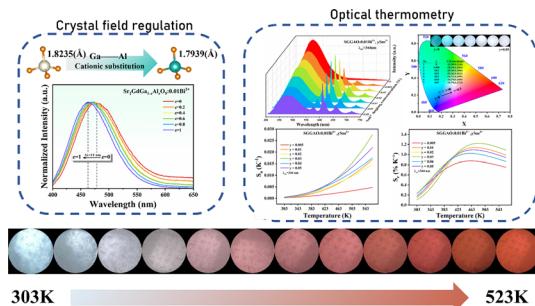
13067



**Simultaneous optical tuning of reflection and fluorescence in a self-organized simple 3D cubic structure by  $\alpha$ -cyanodiarylethene-based chiral fluorescence photoswitches**

Jingjing Wang, Yanrong He, Shan Li, Qingyan Fan and Jinbao Guo\*

13074



**Multicolor tunable  $\text{Bi}^{3+},\text{Sm}^{3+}$  co-doped  $\text{Sr}_2\text{GdGaO}_5$  phosphor and its application in optical thermometry**

Kangrui Qiang, Yingqiang Yu, Yulong Ye, Liang Liang, Qinan Mao, Yang Ding, Yiwen Zhu, Meijiao Liu and Jiasong Zhong\*

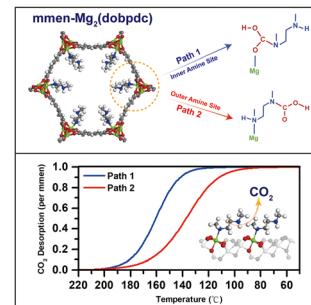


## PAPERS

13085

**Insights into the capture mechanism of  $\text{CO}_2$  by diamine-appended  $\text{Mg}_2(\text{dobpdc})$ : a combined DFT and microkinetic modeling study**

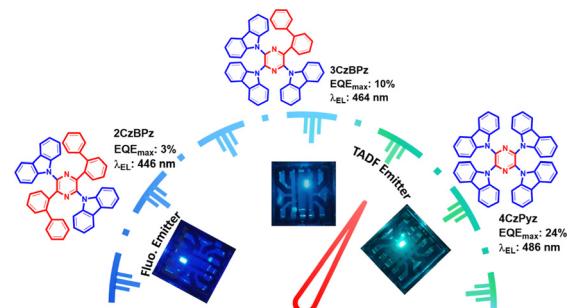
Kuan-Yu Lin, Zhong-Ming Xie, Lu-Sheng Hong and Jyh-Chiang Jiang\*



13095

**Tuning the emission and exciton utilization mechanisms of pyrazine-based multi-carbazole emitters and their use in organic light-emitting diodes**

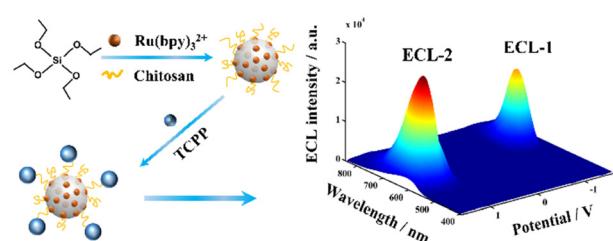
Dongyang Chen, Le Zhang, Tomas Matulaitis, David B. Cordes, Alexandra M. Z. Slawin, Xiao-Hong Zhang, Ifor D. W. Samuel\* and Eli Zysman-Colman\*



13106

**Tetrakis (4-carboxyphenyl) porphyrin and  $\text{Ru}(\text{bpy})_3^{2+}$  modified  $\text{SiO}_2$  nanospheres for potential and wavelength resolved electrochemiluminescence**

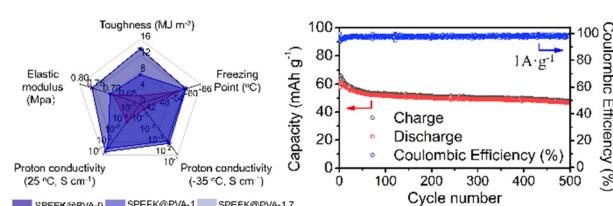
Mingquan Guo, Jiangnan Shu,\* Dexin Du, Yisha Wang and Hua Cui\*



13113

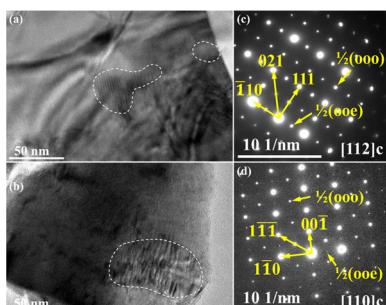
**A freezing-tolerant superior proton conductive hydrogel comprised of sulfonated poly(ether-ether-ketone) and poly(vinyl-alcohol) as a quasi-solid-state electrolyte in a proton battery**

Hao Dong, Lin-Lin Wang, Zhi-Rong Feng, Jie Song, Qiao Qiao,\* Yu-Ping Wu and Xiao-Ming Ren\*



## PAPERS

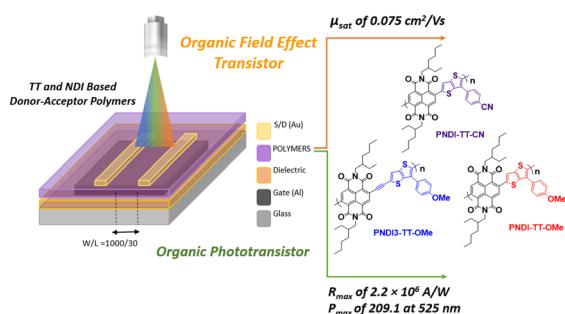
13120



### Energy storage performance of NaNbO<sub>3</sub> lead-free dielectric ceramics by doping Sr(Mg<sub>1/3</sub>Sb<sub>2/3</sub>)O<sub>3</sub>

Qinpeng Dong, Peng Nong, Yue Pan, Dafu Zeng, Mingzhao Xu, Huanfu Zhou, Xu Li\* and Xiuli Chen\*

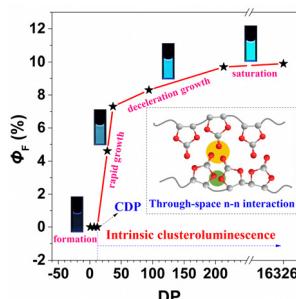
13129



### Synthesis and characterization of naphthalenediimide-thienothiophene-conjugated polymers for OFET and OPT applications

Dilara Gunturkun, Recep Isci, Sheida Faraji, Berkay Sütay, Leszek A. Majewski and Turan Ozturk\*

13142



### Polymerization-induced clusteroluminescence of poly(cyclic carbonate)

Bin Liu,\* Genghong Huang, Hu-liang Lu, Kang Chen, Zishan Yan, Ya-Ling Wang, Bo Chu, Fu-de Ren, Yongzhen Yang and Xing-Hong Zhang\*

