

# 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(29) 9737-10094 (2023)



### Cover

See Sang-Koog Kim *et al.*, pp. 9794–9803.  
Image reproduced by permission of Sang-Koog Kim from *J. Mater. Chem. C*, 2023, **11**, 9794.  
Image created by Younghee Lee.

## REVIEWS

9749

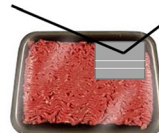
### Biogenic amine sensors using organic $\pi$ -conjugated materials as active sensing components and their commercialization potential

Michael J. Grant, Kathryn M. Wolfe, Cayley R. Harding and Gregory C. Welch\*

#### Sensing Biogenic Amines with Organics



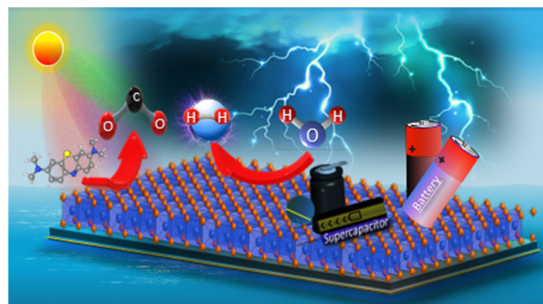
- Colorimetric sensors
- Fluorescent sensors
- Electrochemical sensors



9768

### Versatility of group VI layered metal chalcogenide thin films synthesized by solution-based deposition methods

Vikas V. Magdum, Yogesh M. Chitare, Shirin P. Kulkarni, Prashant D. Sawant, Shraddha A. Pawar, Shweta V. Talekar, Chandrakant D. Lokhande, Umakant M. Patil, Sharad B. Patil and Jayavant L. Gunjekar\*



**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, Ella White

**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 Stingelin, 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

Unjong 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

Neil Robertson, University of Edinburgh, UK

Federico Rosei, University of Trieste, Italy

Yana Vayznof, Technical University of Dresden, 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

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

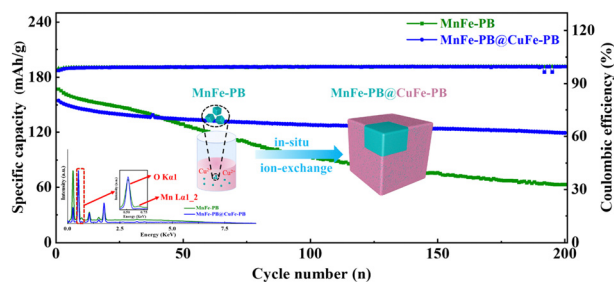


## COMMUNICATION

9787

### Ion exchange to construct a high-performance core-shell MnFe-PB@CuFe-PB cathode material for sodium ion batteries

Hongyu Cheng, Yi-Nuo Liu, Zhuo-Er Yu, Yingying Song, Yinping Qin, Maomao Zhang, Riming Chen, Jingjing Zhou, Yang Liu\* and Bingkun Guo\*

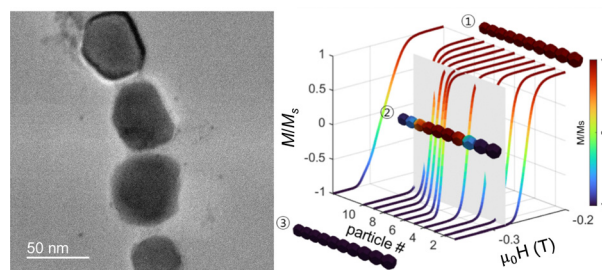


## PAPERS

9794

### Magnetization reversals in magnetosome linear-chain assemblies extracted from magnetotactic bacteria: an experimental and micromagnetic simulation study

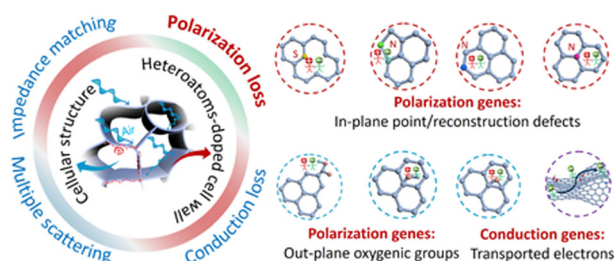
Gyuyoung Park, Hyeonah Jo, Yeon-Ju Oh, Saurabh Pathak and Sang-Koog Kim\*



9804

### Polarization genes dominated heteroatom-doped graphene aerogels toward super-efficiency microwave absorption

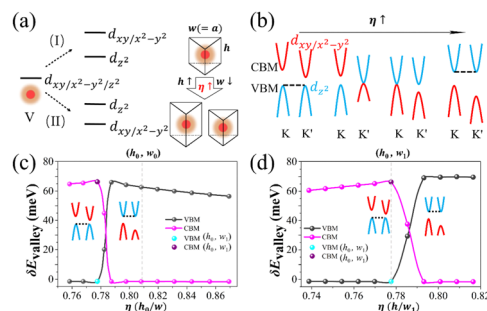
Xiaogu Huang,\* Lan Zhang, Gaoyuan Yu, Jiawen Wei and Gaofeng Shao\*



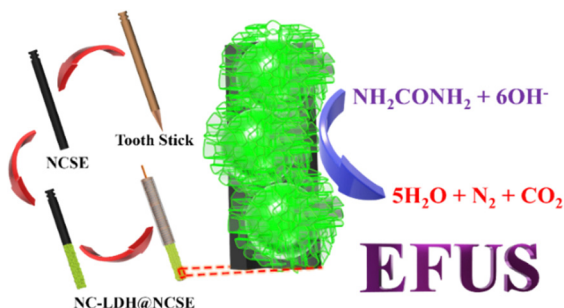
9815

### Effects of crystal deformation on spin-valley interplay and topological phase transition: a case study on VSi<sub>2</sub>X<sub>4</sub> (X = N or P) monolayers

Zhenning Sun, Xinru Li,\* Zhuojun Zhao, Yaojie Zeng, Yadong Wei\* and Jian Wang



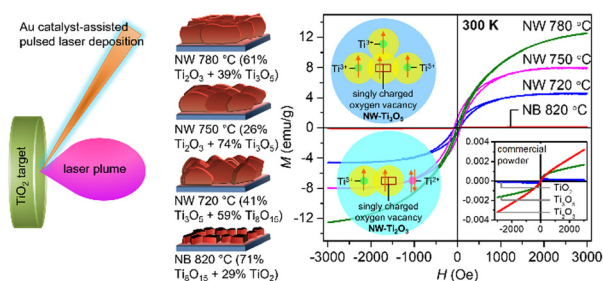
9825



### Exploration of 3D NiCu-layered double hydroxide flowers tailored on a biomass-derived N-doped carbon stick electrode as a binder-less enzyme-free urea sensing probe

Ameer Farithkhan, N. S. K. Gowthaman, Hong Ngee Lim\* and S. Meenakshi\*

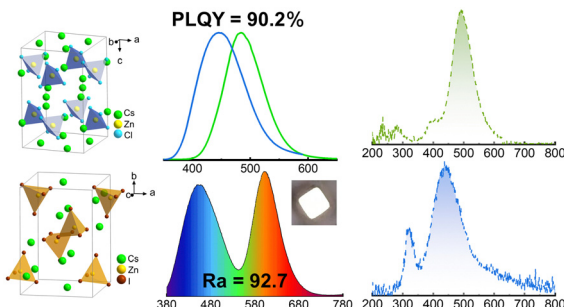
9837



### Oxygen-deficient dopant-free Ti<sub>3</sub>O<sub>5</sub> and Ti<sub>2</sub>O<sub>3</sub> ferromagnetic two-dimensional nanostructures for spin-based electronic devices

Md Anisur Rahman, Joseph Palathinkal Thomas, Mahdi Beedel, Xiaoyi Guan, Nina F. Heinig, Lei Zhang and Kam Tong Leung\*

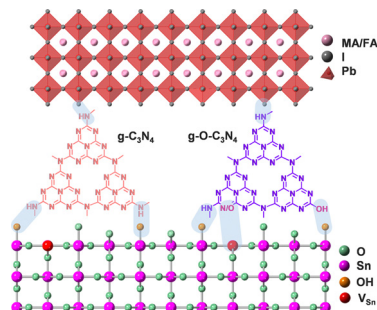
9850



### Efficient emission in copper-doped Cs<sub>3</sub>ZnX<sub>5</sub> (X = Cl, I) for white LEDs and X-ray scintillators

Yubin Yang, Jianghua Wu, Tianrui Zhou, Yunluo Wang, Jiaqian Zheng, Ruifeng Liu, Jingshan Hou, Xiang Li, Lianjun Wang, Wan Jiang and Haijie Chen\*

9860



### Trap engineering using oxygen-doped graphitic carbon nitride for high-performance perovskite solar cells

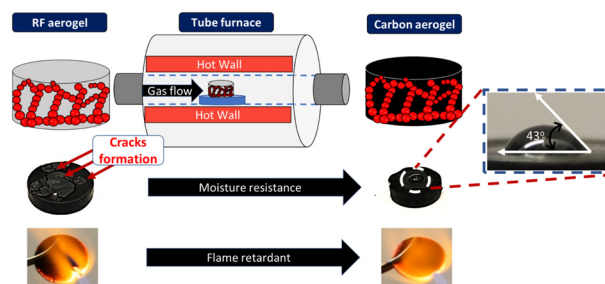
Yaling Lei, Xiaoyan Li, Jingying Liang, Junzhe Shi, Yunhao Wei, Pingli Qin,\* Hong Tao, Jianjun Chen, Zuojun Tan\* and Hongwei Lei\*



9871

## Next generation thermal insulators for operation in high-temperature and humid environments through aerogel carbonization

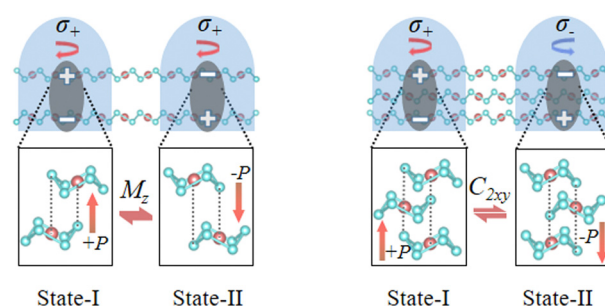
Mohammed Alshrah, Lun Howe Mark, Piyapong Buahom, Jung Hyub Lee, Sasan Rezaei, Hani E. Naguib and Chul B. Park\*



9880

## Tunable valley-selective circular polarization in vdW multilayers consisting of inversion-symmetric monolayers

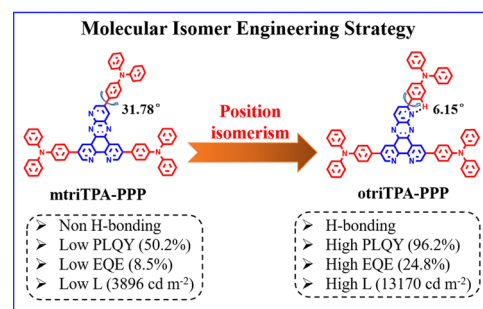
Xikui Ma, Weifeng Li, Yangyang Li, Xiangdong Liu, Xian Zhao\* and Mingwen Zhao\*



9889

## Isomerization design for improving the efficiency of red thermally activated delayed fluorescence emitters based on pyridopyrazinophenanthroline acceptor

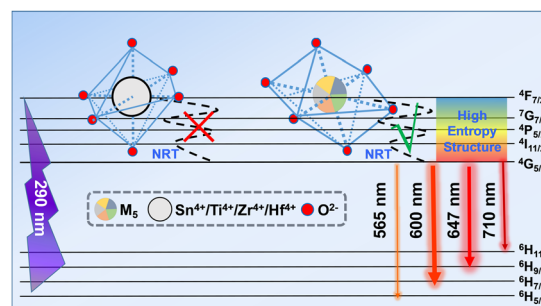
Guo Yuan, Da-Hao Wang, Feng-Ming Xie, Bo Zhang, Ying-Yuan Hu, Qiang Zhang, Hao-Ze Li, Yan-Qing Li,\* Jian-Xin Tang\* and Xin Zhao\*



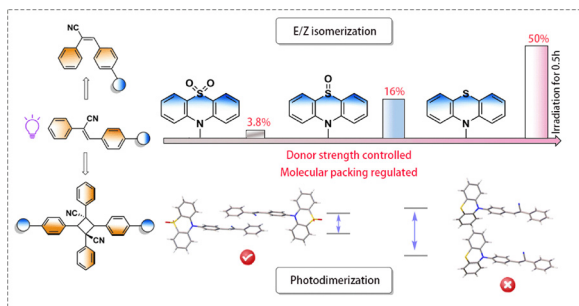
9899

## Superlattice-stabilized structure and charge transfer assisted photoluminescence enhancement in a samarium-doped high entropy perovskite oxide

Lei Xia, Zhan Mao, Xin Wang, Jing Zhu, Jiyang Xie, Zhe Wang and Wanbiao Hu\*



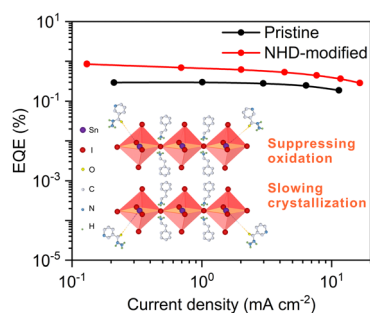
9908



### Modulating the electron-donating ability of aggregation-induced emission molecules for improved photo-responsive properties

Ri-Na Su, Qing-Qing Pan, Guan-Yu Ding, Jing Sun,\*  
Li-Li Wen,\* Kui-Zhan Shao, Si-Bo Wang,  
Guo-Gang Shan\* and Zhong-Min Su

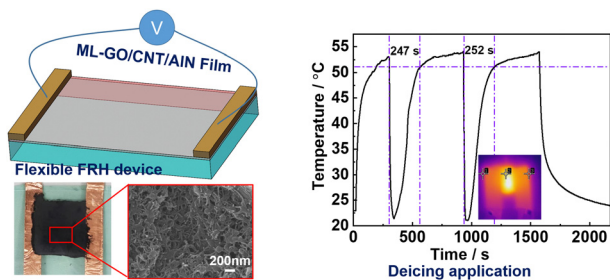
9916



### Regulated crystallization with minimized degradation for pure-red lead-free perovskite light-emitting diodes

Zong-Guang Ma, Yang Shen,\* Kai Zhang, Long-Xue Cao,  
Hao Ren, Wei-Shuo Chen, Huai-Xin Wei, Yan-Qing Li,\*  
Satoshi Kera and Jian-Xin Tang\*

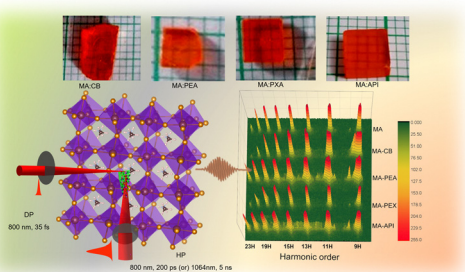
9925



### Multi-scale GO/CNT/AlN nanocomposites for high-performance flexible electrothermal film heaters

Zhaoling Huang, Siyuan Li, Hao Guo, Caiping Huang,  
Yuyu Bian, Yubing Gong, Jiaqiang Huang\* and Qi Zeng\*

9937



### Additive engineering in CH<sub>3</sub>NH<sub>3</sub>PbBr<sub>3</sub> single crystals for terahertz devices and tunable high-order harmonics

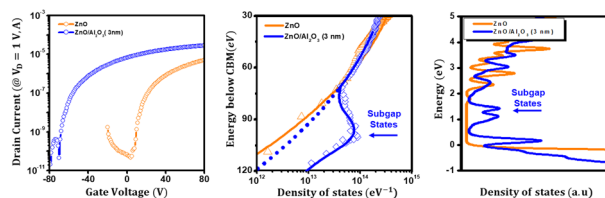
Sarvani Jowhar Khanam, Srinivasa Rao Konda,\*  
Azmeera Premalatha, Ravi Ketavath, Wufeng Fu,  
Wei Li\* and Banavoth Murali\*



9952

### Subgap states in aluminium- and hydrogen-doped zinc-oxide thin-film transistors

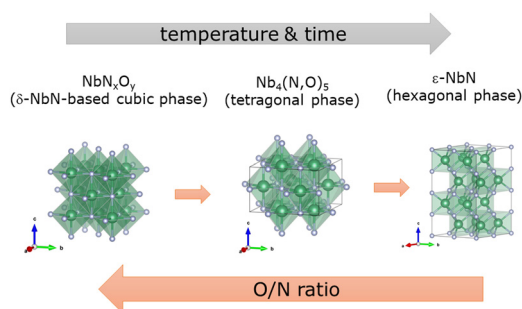
Minho Yoon,\* Dongho Hyun and Heung-Sik Kim\*



9960

### The effect of ammonolysis conditions on the structural properties and oxidation kinetics of cubic niobium oxynitride

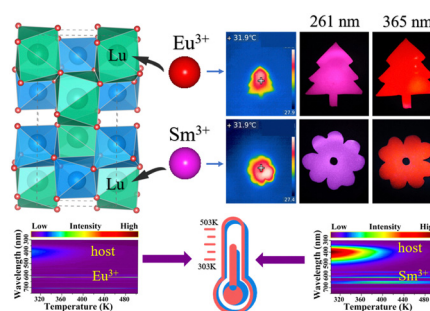
Vanessa C. D. Graça,\* Laura I. V. Holz, Francisco J. A. Loureiro, Glenn C. Mather and Duncan P. Fagg\*



9974

### Tunable luminescence in Eu<sup>3+</sup>/Sm<sup>3+</sup> single-doped LuNbO<sub>4</sub> for optical thermometry and anti-counterfeiting

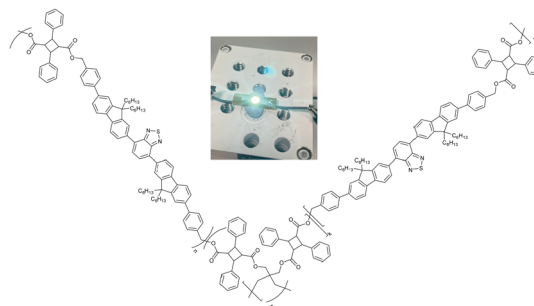
Yuqi Chen, Yu Xue, Qinan Mao, Lang Pei, Yang Ding, Yiwen Zhu, Meijiao Liu and Jiasong Zhong\*



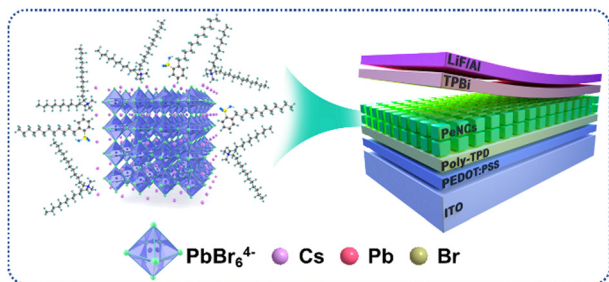
9984

### A cross-linkable, organic down-converting material for white light emission from hybrid LEDs

Hao Yang, Jochen Bruckbauer, Lyudmyla Kanibolotska, Alexander L. Kanibolotsky, Joseph Cameron, David J. Wallis, Robert W. Martin\* and Peter J. Skabara\*



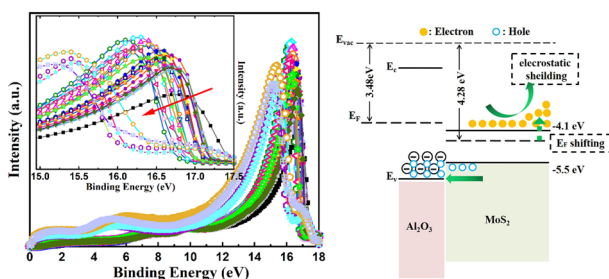
9996



### Trap states engineering toward all-inorganic CsPbBr<sub>3</sub> perovskite nanocrystals for highly efficient light-emitting diodes

Xudong Jin, Yanqin Miao, Jianhua Dong, Jingkun Wang, Qiqing Lu, Min Zhao,\* Bingshe Xu\* and Junjie Guo\*

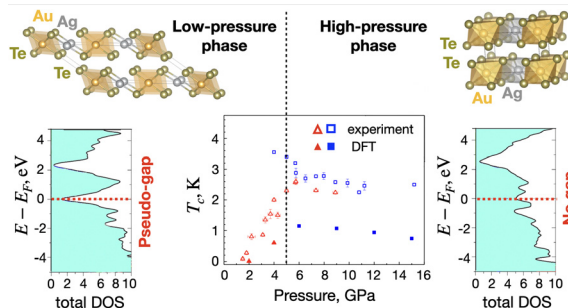
10004



### The effect of Al<sub>2</sub>O<sub>3</sub> electrical shielding on MoS<sub>2</sub> energy structure modulation in MoS<sub>2</sub>/p-Si heterojunction solar cells

Yu Zhang,\* Zening Li, Peiyi Tong, Lukai Zhang, Wei Yu and Xiuling Liu\*

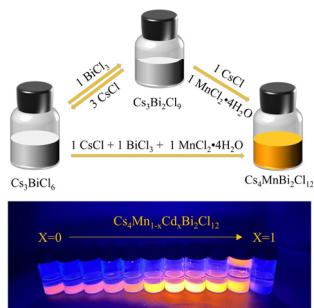
10016



### Silvanite AuAgTe<sub>4</sub>: a rare case of gold superconducting material

Yehezkel Amiel, Gyanu P. Kafle, Evgenia V. Komleva, Eran Greenberg, Yuri S. Ponosov, Stella Chariton, Barbara Lavina, Dongzhou Zhang, Alexander Palevski, Alexey V. Ushakov, Hitoshi Mori, Daniel I. Khomskii, Igor I. Mazin, Sergey V. Streltsov, Elena R. Margine and Gregory Kh. Rozenberg\*

10025



### Continuous synthesis of all-inorganic low-dimensional bismuth-based metal halides Cs<sub>4</sub>MnBi<sub>2</sub>Cl<sub>12</sub> from reversible precursors Cs<sub>3</sub>BiCl<sub>6</sub> and Cs<sub>3</sub>Bi<sub>2</sub>Cl<sub>9</sub> under phase engineering

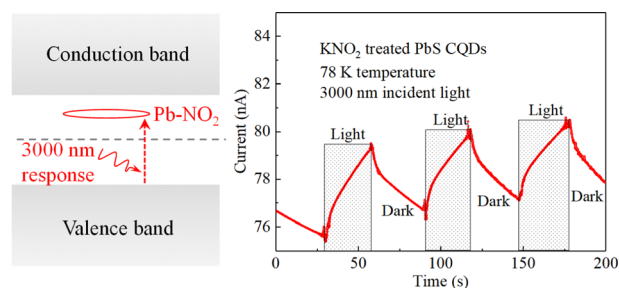
Chunli Zhao, Yuan Gao\* and Jianbei Qiu\*



10033

### Mid-infrared response of PbS colloidal quantum dot solids

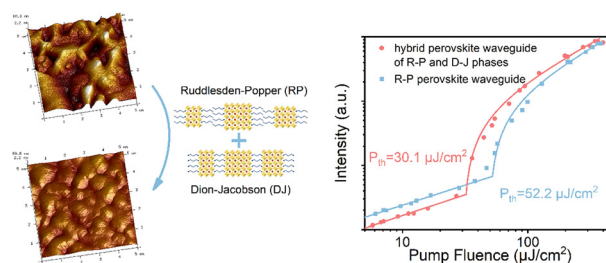
Jungang He,\* Xianchang Zhou, Ya Wang, Mohan Yuan, Hang Xia, Xiao Chen, You Ge, Xia Wang, Liang Gao\* and Jiang Tang



10043

### Amplified spontaneous emission from waveguides based on hybrid quasi-2D perovskites of Dion–Jacobson and Ruddlesden–Popper phases

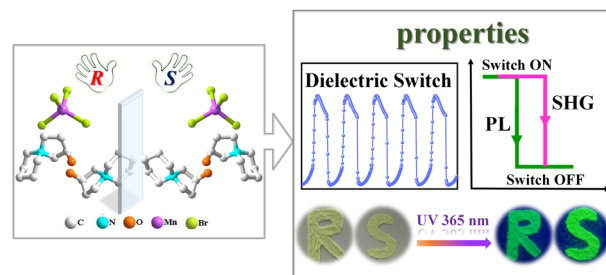
Yang Tang, Junhan Guo, Bin Liu, Liang Qin,\* Zhenbo Deng, Yufeng Hu, Feng Teng, Zhidong Lou and Yanbing Hou\*



10051

### Dielectric/SHG/PL triple-channel properties in chiral spirocyclic organic–inorganic hybrids

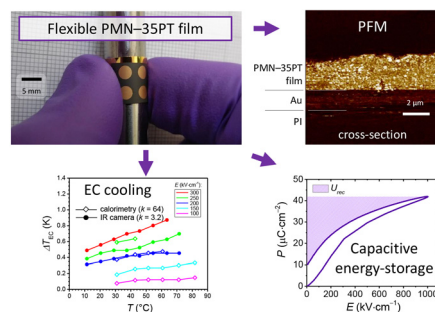
Xin-Ran Fan, Meng-Meng Lun, Zhi-Jie Wang, Bo-Wen Deng, Da-Wei Fu,\* Chang-Feng Wang, Hai-Feng Lu\* and Zhi-Xu Zhang\*



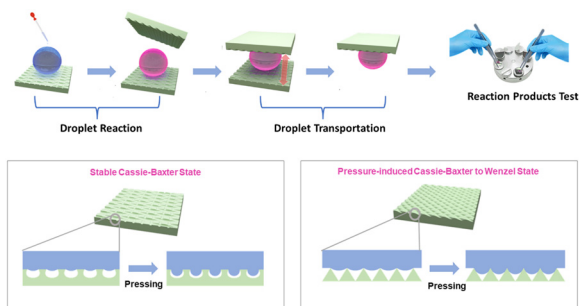
10058

### Multifunctional flexible ferroelectric thick-film structures with energy storage, piezoelectric and electrocaloric performance

Matej Sadl, Uros Prah, Veronika Kovacova, Emmanuel Defay, Tadej Rojac, Andrej Lebar, Joško Valentinčič and Hana Ursic\*



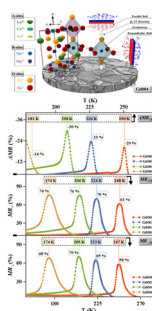
10069



### Stretchable superhydrophobic elastomers with on-demand tunable wettability for droplet manipulation and multi-stage reaction

Xiaohong Ding, Yunchi Cai, Guofei Lu, Jiapeng Hu, Jinyun Zhao, Longhui Zheng, Zixiang Weng, Huanyu Cheng,\* Jing Lin\* and Lixin Wu\*

10079



### Polycrystalline $\text{La}_{0.66}\text{Gd}_{0.04}\text{Ca}_{0.3}\text{MnO}_3$ for magnetic-response applications: concurrent anisotropic magnetoresistance and magneto-transport under a low magnetic field

Sheng'an Yang, Junfeng Li, Jin Hu, Ruidong Xu, Hui Zhang, Lingde Kong, Xiang Liu, Ji Ma\* and Qingming Chen\*

