

# Materials Advances

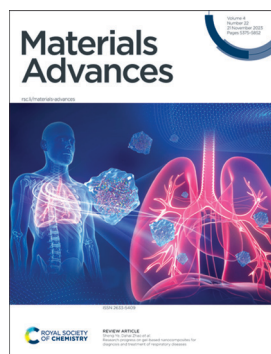
An open access journal publishing across the breadth of materials science

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

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.

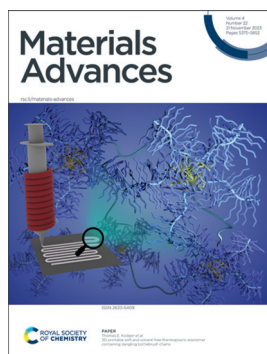
## IN THIS ISSUE

ISSN 2633-5409 CODEN MAADC9 4(22) 5375-5852 (2023)



### Cover

See Sheng Ye, Dahai Zhao *et al.*, pp. 5431-5452.  
Image reproduced by permission of Jing Ye from *Mater. Adv.*, 2023, 4, 5431.



### Inside cover

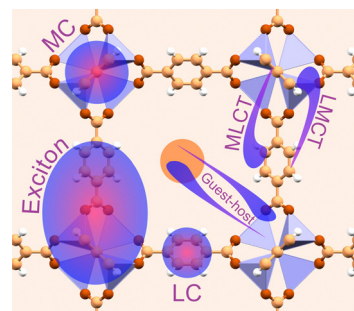
See Thomas E. Kodger *et al.*, pp. 5535-5545.  
Image reproduced by permission of Thomas E. Kodger from *Mater. Adv.*, 2023, 4, 5535.

## PERSPECTIVES

5388

### Simulating excited states in metal organic frameworks: from light-absorption to photochemical CO<sub>2</sub> reduction

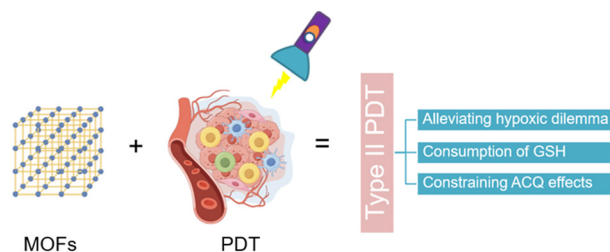
Michael Ingham, Alex Aziz, Devis Di Tommaso\* and Rachel Crespo-Otero\*



5420

### An oxygen-generating metal organic framework nanoplatform as a "synergy motor" for extricating dilemma over photodynamic therapy

Meihong Zhang, Yixian Zhou, Biyuan Wu, Chao Lu,\* Guilan Quan,\* Zhengwei Huang,\* Chuanbin Wu and Xin Pan



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

Jeremy Allen

**Deputy Editor**

Hannah Kerr

**Editorial Production Manager**

Daniella Ferlucio

**Assistant Editors**

Zita Zachariah, Serra Arslanac Sengelen and Zifei Lu

**Editorial Assistant**

Rosie Hague

**Publishing Assistant**

Allison Holloway

**Publisher**

Neil Hammond

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

For pre-submission queries please contact Jeremy Allen, Executive Editor. E-mail: [materialsadvances-rsc@rsc.org](mailto:materialsadvances-rsc@rsc.org)

Materials Advances (electronic: ISSN 2633-5409) is published 24 times a year by the Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, UK CB4 0WF.

Materials Advances is a Gold Open Access journal and all articles are free to read. Please email [orders@rsc.org](mailto:orders@rsc.org) to register your interest or contact 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)

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)

# Materials Advances

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

*Materials Advances* publishes experimental and theoretical work across the breadth of materials science.

**Editorial Board****Editors-in-Chief**

Anders Hagfeldt, EPFL, Switzerland  
Jeroen Cornelissen, University of Twente, The Netherlands  
Natalie Stingelin, Georgia Institute of Technology, USA

**Associate Editors**

A. S. Achalkumar, Indian Institute of Technology, India  
Veronica Augustyn, North Carolina State University, USA  
Viola Birss, University of Calgary, Canada  
Kaushik Chatterjee, Indian Institute of Science, India  
Elizabeth Cosgriff-Hernandez, University of Texas at Austin, USA  
Rachel Crespo-Otero, Queen Mary University of London, UK  
Gemma-Louise Davies, University College London, UK  
Goutam De, S N Bose National Centre for Basic Sciences, India  
Renaud Demadrille, Interdisciplinary Research Institute of Grenoble, France  
Håkan Engqvist, Uppsala University, Sweden  
Antonio Facchetti, Northwestern University and Flexterra Corporation, USA

Ghim Wei Ho, National University of Singapore, Singapore  
Yun Jeong Hwang, Korea Institute of Science and Technology, South Korea  
Unyong Jeong, POSTECH, South Korea  
Ji Jian, Zhejiang University, China  
Oana Jurchescu, Wake Forest University, USA  
Kisuk Kang, Seoul National University, South Korea  
Subrata Kundu, Central Electrochemical Research Institute (CECRI), India  
Dan Li, Jinan University, China  
Mingzhu Li, Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, China  
Shaoqin Liu, Harbin Institute of Technology, China  
David Lou, Nanyang Technological University, Singapore  
Yi-Chun Lu, The Chinese University of Hong Kong, Hong Kong  
Martyn McLachlan, Imperial College London, UK  
Yoshiko Miura, Kyushu University, Japan  
Kasper Moth-Poulsen, Chalmers University of Technology, Sweden  
Ana Flavia Nogueira, University of Campinas,

**Brazil**

Erin Ratcliff, University of Arizona, USA  
Federico Rosei, University of Trieste, Italy  
Jennifer Rupp, Massachusetts Institute of Technology, USA  
Miriam Unterlass, Vienna University of Technology, Austria  
Yana Vaynzof, Technical University of Dresden, Germany  
Maia Vergniory, Max Planck Institute for Chemical Physics of Solids, Germany  
Jessica Winter, Ohio State University, USA  
Lydia Wong, Nanyang Technological University, Singapore  
Li-Zhu Wu, Technical Institute of Physics and Chemistry, China  
Zhiguo Xia, South China University of Technology, China  
Yusuke Yamauchi, University of Queensland, Australia  
Chengzhong Yu, University of Queensland, Australia  
Haoli Zhang, Lanzhou University, China  
Ni Zhao, Chinese University of Hong Kong, Hong Kong  
Zhen Zhou, Nankai University, China

**Advisory Board**

Please see the Materials Advances journal webpage for full details of our advisory board: [rsc.li/materials-advances](http://rsc.li/materials-advances)

**Information for Authors**

Full details on how to submit material for publication in Materials Advances 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-advances](http://rsc.li/materials-advances)

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

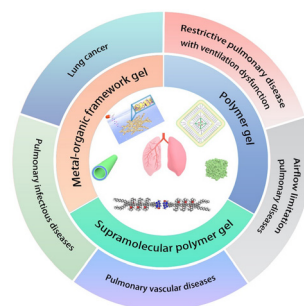


## REVIEWS

5431

## Research progress on gel-based nanocomposites for diagnosis and treatment of respiratory diseases

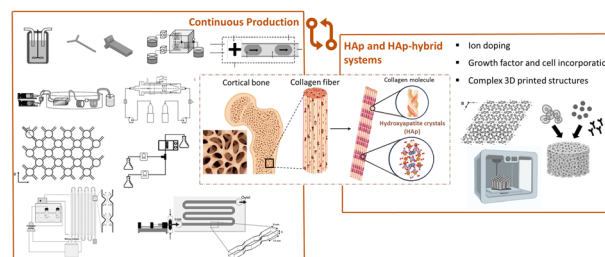
Jing Ye, Wenjing Pei, Jing Zhu, Ping Li, Hui Liu, Lei Gao, Changxiu Ma, Rongrong Gu, Sheng Ye\* and Dahai Zhao\*



5453

## Tackling current production of HAp and HAp-driven biomaterials

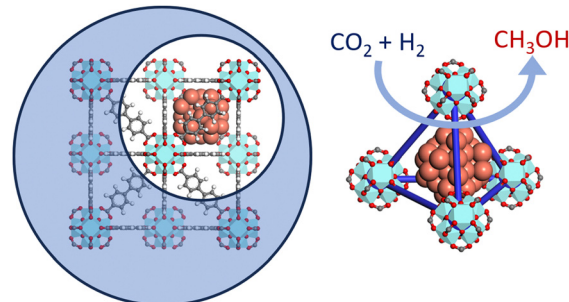
Anabela Veiga, Sara Madureira, João B. Costa,\* Filipa Castro, Fernando Rocha and Ana L. Oliveira\*



5479

## Direct CO<sub>2</sub> to methanol reduction on Zr<sub>6</sub>-MOF based composite catalysts: a critical review

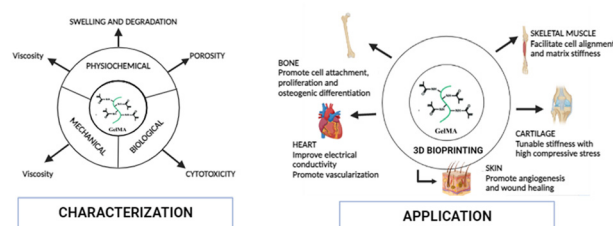
Elif Tezel, Dag Kristian Sannes, Stian Svelle, Petra Ágota Szilágyi\* and Unni Olsbye\*



5496

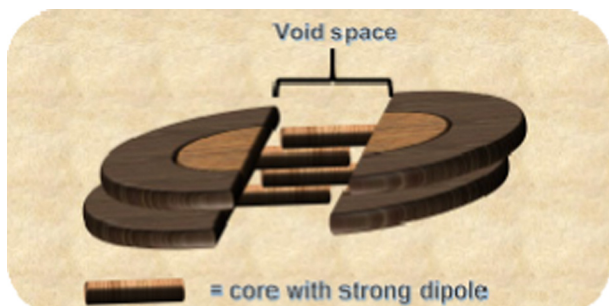
## An insight into synthesis, properties and applications of gelatin methacryloyl hydrogel for 3D bioprinting

Rudra Nath Ghosh, Joseph Thomas, Vaidehi B. R., Devi N. G., Akshitha Janardanan, Pramod K. Namboothiri and Mathew Peter\*



## COMMUNICATION

5530

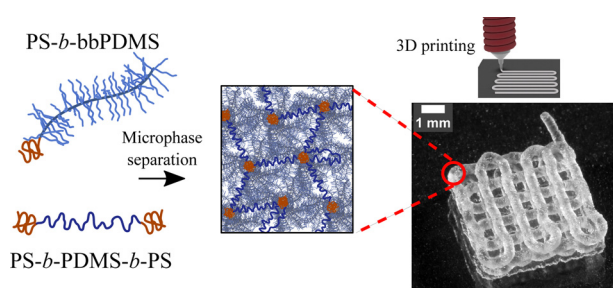


### Direct evidence of mesogenic dendrons with free void space by Brunauer–Emmett–Teller (BET) isotherms

Yao-Chih Lu, Jun-Cheng Wang, Yun-He Yang and Long-Li Lai\*

## PAPERS

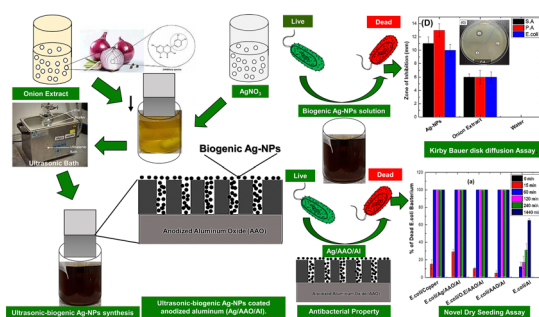
5535



### 3D printable soft and solvent-free thermoplastic elastomer containing dangling bottlebrush chains

Vahid Asadi, Renee Dolleman, Jasper van der Gucht and Thomas E. Kodger\*

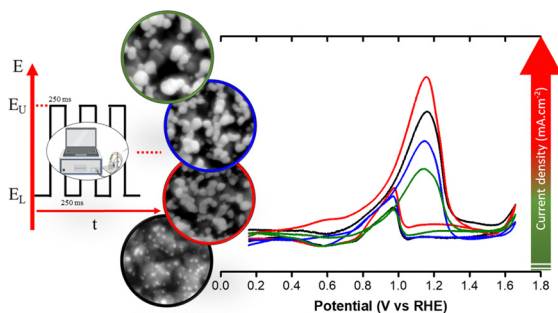
5546



### Ultrasonic–biogenic synthesis of silver on anodized aluminum with superior antibacterial properties

Henry Agbe,\* Dilip Kumar Sarkar, X.-Grant Chen and David Dodoo-Arhin

5556



### Square-wave pulse electrodeposition of gold nanoparticles for ethanol electrooxidation

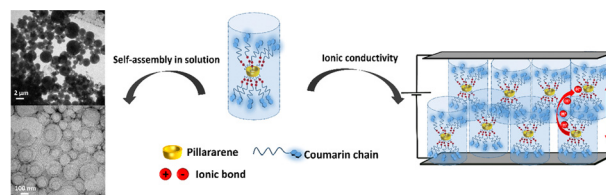
Setia Budi,\* Annisa Auliya, Suci Winarsih, Mohammad Hamzah Fauzi and Yusmaniar



5564

### Ionic self-assembly of pillar[5]arenes: proton-conductive liquid crystals and aqueous nanoobjects with encapsulation properties

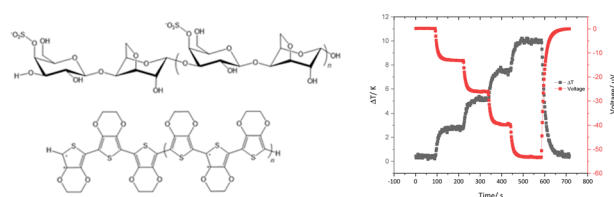
Iván Marín, Rosa I. Merino, Joaquín Barberá, Alberto Concellón and José L. Serrano\*



5573

### Conducting poly(3,4-ethylenedioxythiophene) materials with sustainable carrageenan counter-ions and their thermoelectric properties

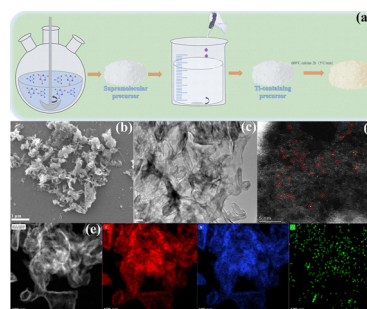
Zhongnan Duan, Joseph Phillips, Letizia Liirò-Peluso, Simon Woodward, Oleg Makarovskiy, Michael P. Weir, H. Jessica Pereira\* and David B. Amabilino\*



5585

### Application of single-atom Ti-doped g-C<sub>3</sub>N<sub>4</sub> in photocatalytic H<sub>2</sub>O<sub>2</sub> production

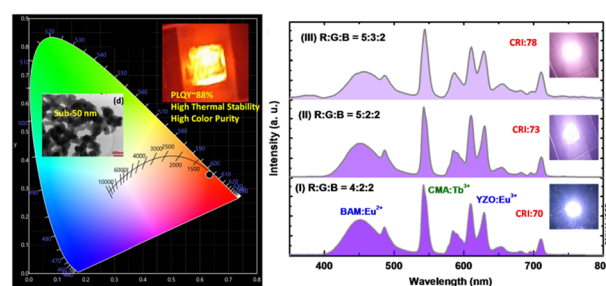
Tinglei Wang, Jiayu Xin, Zhen Li, Yong Fan\* and Yu Wang\*



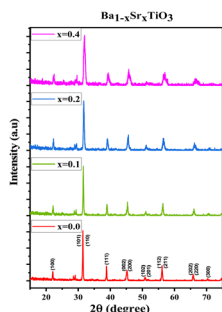
5594

### Ultra-bright and thermally stable deep red emitting doped yttrium zirconate nanoparticles for tunable white LEDs and indoor plant growth

Reshmi Thekke Parayil, Santosh Kumar Gupta,\* Malini Abraham, Subrata Das, Shreyas S. Pitale, Kathi Sudarshan and Manoj Mohapatra



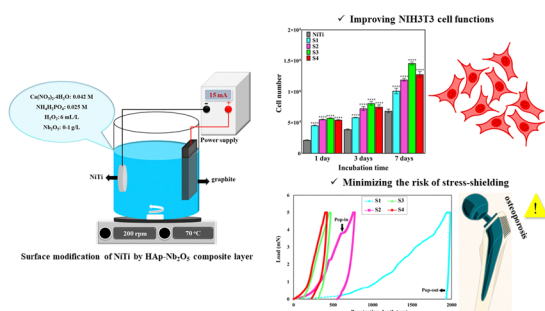
5605



### Structural and dielectric characterization of synthesized nano-BSTO/PVDF composites for smart sensor applications

Marwa M. Hussein,\* Samia A. Saafan, H. F. Abosheisha, Amira A. Kamal, Abd El-razek Mahmoud, Di Zhou, Sergei V. Trukhanov,\* Tatiana I. Zubar, Alex V. Trukhanov and Moustafa A. Darwish\*

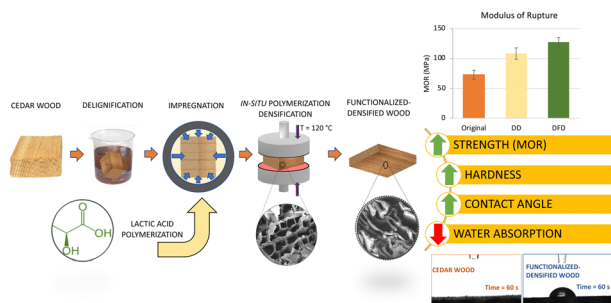
5618



### Encouraging tribomechanical and biological responses of hydroxyapatite coatings reinforced by various levels of niobium pentoxide particles

Mir Saman Safavi,\* Jafar Khalil-Allafi,\* Amir Motallebzadeh, Cristina Volpini, Vida Khalili and Livia Visai\*

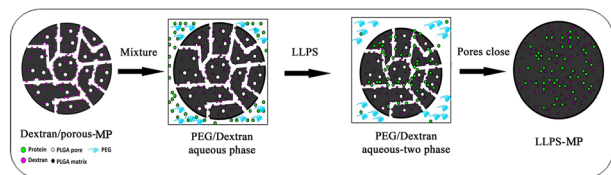
5633



### Poly(lactic acid)/wood-based *in situ* polymerized densified composite material

Akash Madhav Gondaliya, Kieran Foster and E. Johan Foster\*

5643



### Liquid–liquid phase separation for microencapsulation of native cytokine to enhance immune activation

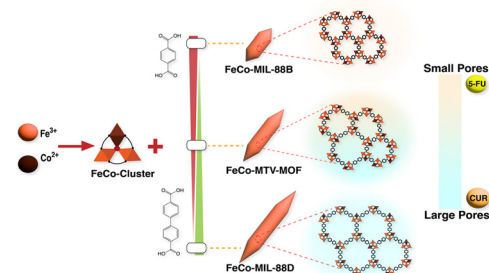
Zhenhua Hu, Li Cheng, Qiuling Chen, Tianqing Xin and Xiaoyan Wu\*



5653

### A multivariate metal–organic framework based pH-responsive dual-drug delivery system for chemotherapy and chemodynamic therapy

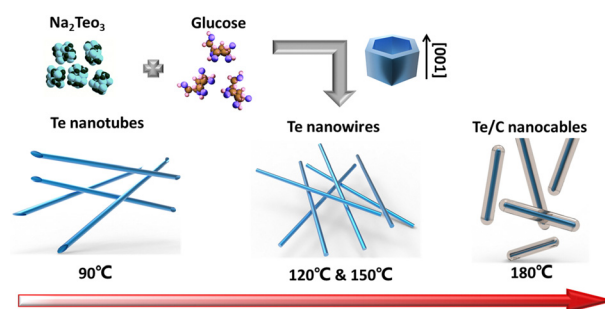
Muhammad Usman Akbar, Arslan Akbar, Umair Ali Khan Saddozai, Malik Ihsan Ullah Khan, Muhammad Zaheer\* and Muhammad Badar\*



5668

### Morphology-controlled green synthesis of tellurium nanostructures and applications of Te/MXene hybrid structures

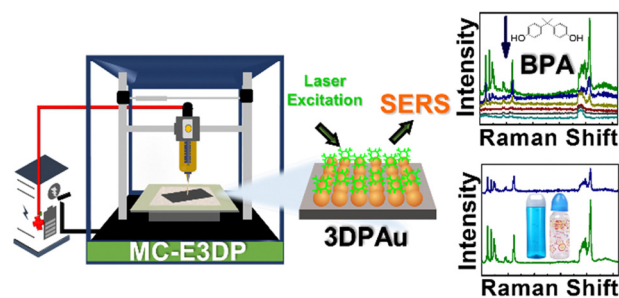
Mengchen Xu, Jinshu Li, Qingshan Yang, Lu Jiang, Jiaqi He, Dawei He,\* Yongsheng Wang\* and Yajie Yang\*



5674

### Meniscus-confined capping-free 3D printed gold nanoparticles for quantitative SERS detection of bisphenol A

Netrapal Singh, Manoj Kumawat, Hafsa Siddiqui, Koyalada Bhavani Srinivas Rao, Satendra Kumar, Manoj Goswami, Sathish Natarajan, Mohammed Akram Khan, Avanish Kumar Srivastava and Surender Kumar\*



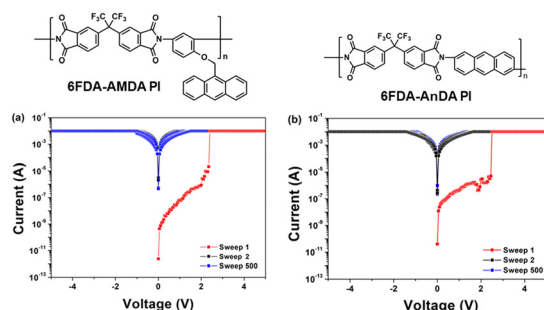
5683

### Environmentally benign fabrication of superparamagnetic and photoluminescent Ce, Tb-codoped Fe<sub>3</sub>O<sub>4</sub>-gluconate nanocrystals from low-quality iron ore intended for wastewater treatment

Utsav Sengupta, Muthaimanoj Periyasamy, Sudipta Mukhopadhyay and Arik Kar\*



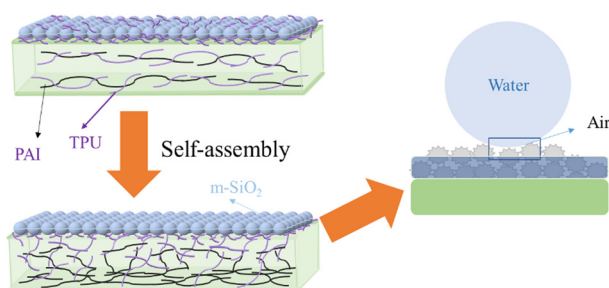
5706



### Memory characteristics of anthracene-based polyimides in non-volatile resistive memory devices

Seung-Hyun Lee, Sechang Park, Ju-Young Choi, Yun-Je Choi, Hyung Woo Ji, Hyeyoung Joung, Dam-Bi Kim, Kang-Hoon Yoon, Gyumin Ji, Daeho Choi, Jaekang Lee, Ki-Jung Paeng, Jaesung Yang, Soohaeng Cho\* and Chan-Moon Chung\*

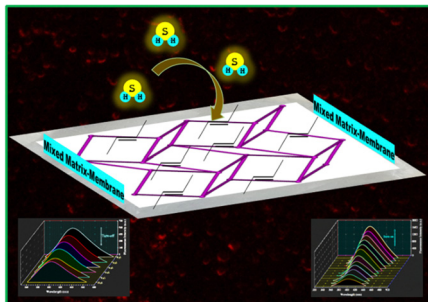
5716



### Self-assembly of hierarchical porous structure for stretchable superhydrophobic films by delicately controlling the surface energy

Shuhan Hou, Insub Noh, Meng Yue, Yanbin Wang,\* Hyung Do Kim,\* Hideo Ohkita\* and Biaobing Wang\*

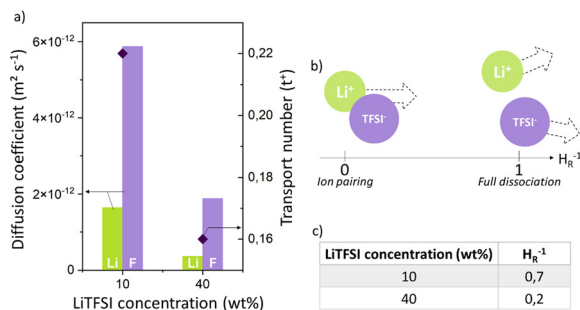
5730



### Enhancing the sensitivity of a water stable MOF as a H<sub>2</sub>S gas sensor by the fabrication of a mixed-matrix membrane

Mouli Das Dawn, Karabi Nath, Subhajt Saha, Pritam Kumar Roy, Mahitosh Mandal and Kumar Biradha\*

5740



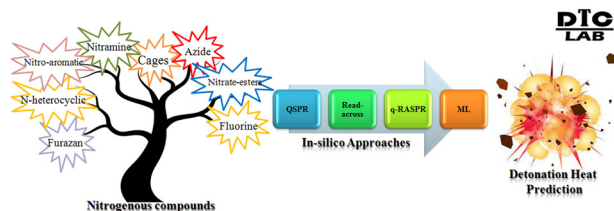
### Towards N-rich solid polymer electrolytes for Li-ion batteries?

L. Artigues, M. Deschamps, F. Salles, V. Chaudoy, V. Lapinte and L. Monconduit\*





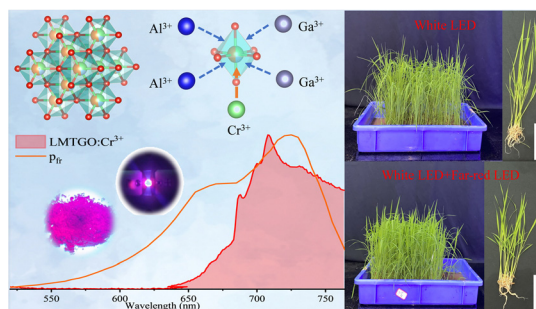
5797



### Machine learning-based q-RASPR predictions of detonation heat for nitrogen-containing compounds

Shubham Kumar Pandey, Arkaprava Banerjee and Kunal Roy\*

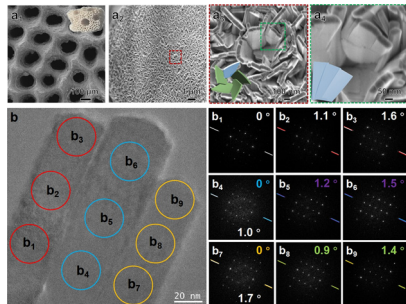
5808



### Spectroscopically enhanced far-red phosphor $\text{Li}_2\text{Mg}_3\text{TiO}_6:\text{Cr}^{3+}$ and its application prospects to the cold resistance of rice

Yibiao Ma, Siying Li, Jiaqi Wei, Weifang Liao, Beibei Quan, Maxim S. Molokeev, Ming Cheng, Xiaoyan Chen, Zhi Zhou\* and Mao Xia\*

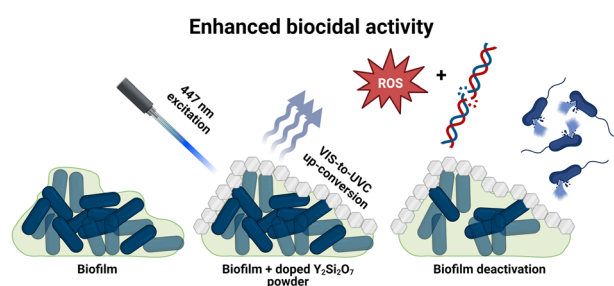
5817



### Chiral mesostructured hydroxyapatite on 3D macroporous coralline scaffolds for enantio-selective osteogenesis

Chao Zhou, Anqi Liu, Ping Li, Jing Ai, Lu Han, Shaoyang Zhang, Shuai Chen, Yuanming Ouyang,\* Baojie Li,\* Shunai Che\* and Cunyi Fan\*

5827



### Enhanced biocidal activity of $\text{Pr}^{3+}$ doped yttrium silicates by $\text{Tm}^{3+}$ and $\text{Yb}^{3+}$ co-doping

Patryk Fałat, Min Ying Tsang, Irena Maliszewska, Szymon J. Zelewski, Bartłomiej Cichy, Tymish Y. Ohulchansky, Marek Samoć, Marcin Nyk and Dominika Wawrzyńczyk\*



5838

## Rapid microwave synthesis of sustainable magnetic framework composites of UTSA-16(Zn) with Fe<sub>3</sub>O<sub>4</sub> nanoparticles for efficient CO<sub>2</sub> capture

John Luke Woodliffe, Amy-Louise Johnston, Michael Fay, Rebecca Ferrari, Rachel L. Gomes, Ed Lester, Ifty Ahmed and Andrea Laybourn\*

