

# 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 6(9) 2705-3004 (2025)



### Cover

See Xianlong Zhang, Chunming Lyu *et al.*, pp. 2781–2793. Image reproduced by permission of Chunming Lyu from *Mater. Adv.*, 2025, 6, 2781.

## EDITORIAL

2714

### Introduction to advances in emerging thermoelectric materials and devices

Krishna Nama Manjunatha,\* Shashi Paul,\* Satyajit Sahu and Mona Zebarjadi

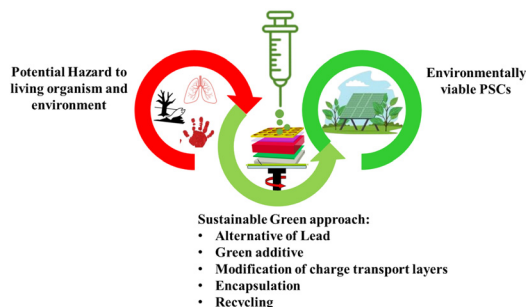


## REVIEWS

2718

### Lead-free alternatives and toxicity mitigation strategies for sustainable perovskite solar cells: a critical review

Md. Helal Miah, Mayeen Uddin Khandaker,\* Md. Jakir Hossen, Noor-E-Ashrafi, Ismat Jahan, Md. Shahinuzzaman, Mohammad Nur-E-Alam, Mohamed Y. Hanfi, Md. Habib Ullah and Mohammad Aminul Islam



# Advance your career in science

with professional recognition that showcases your **experience, expertise and dedication**

## Stand out from the crowd

Prove your commitment to attaining excellence in your field

## Gain the recognition you deserve

Achieve a professional qualification that inspires confidence and trust

## Unlock your career potential

Apply for our professional registers (RSci, RSciTech) or chartered status (CChem, CSci, CEnv)

## Apply now

[rsc.li/professional-development](https://rsc.li/professional-development)

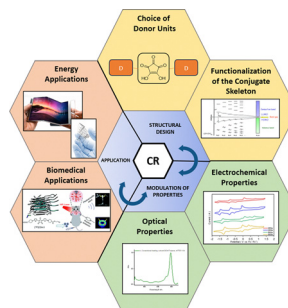


## REVIEWS

2753

### Croconic acid-based compounds: synthesis, structural characteristics, properties and applications of an intriguing class of functional organic materials

Maria Montrone, Umberto Berardi,\* Antonio Cardone\* and Maria Annunziata M. Capozzi\*

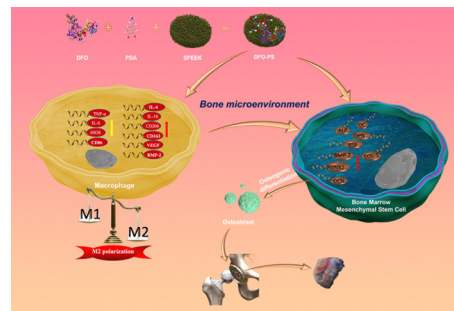


## PAPERS

2781

### DFO-modified polydopamine sulfonated PEEK enhances osseointegration through macrophage immunomodulation and osteogenic differentiation of BMSCs

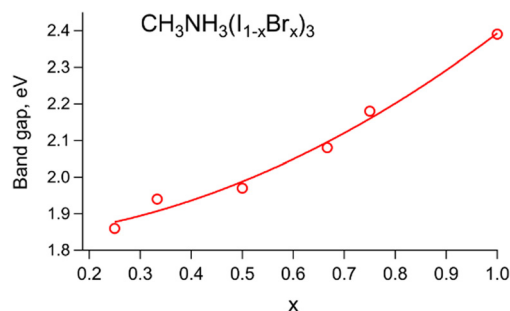
Shengjie Wang, Wei Liu, Chao Yang, Xianlong Zhang\* and Chunming Lyu\*



2794

### On the band gap variation in $\text{CH}_3\text{NH}_3\text{Pb}(\text{I}_{1-x}\text{Br}_x)_3$

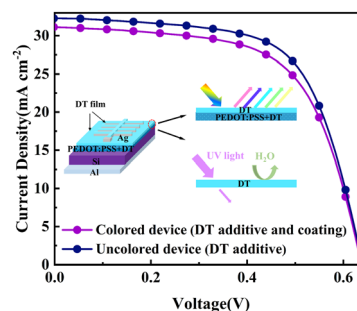
Sergei M. Butorin



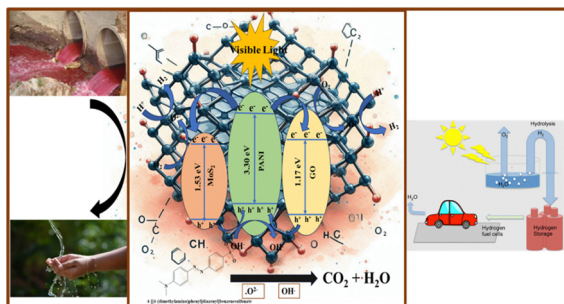
2800

### Application of a multifunctional liquid crystal material in colored PEDOT:PSS/Si heterojunction solar cells

Zheng Zhou, Shibo Chen, Yingming Shen, Juan Wang, Guijun Zhang, Yang Shi, Haixia Wu, Jingjing Luo, Xiaohong Cheng\* and Yu Yang\*



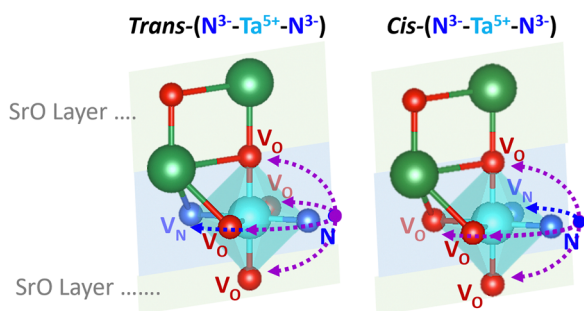
2811



### Design and synthesis of PANI/GO/MoS<sub>2</sub> nanocomposites *via* oxidative polymerization for efficient photocatalytic applications: organic pollutant degradation and hydrogen generation

Pritam Hait, Rajeev Mehta and Soumen Basu\*

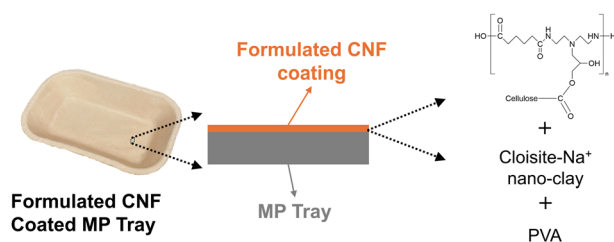
2823



### Influence of anion ordering on defect diffusion anisotropy in layered perovskite Sr<sub>2</sub>TaO<sub>3</sub>N: implications for oxynitride stability

Joshua J. Brown\* and Alister J. Page

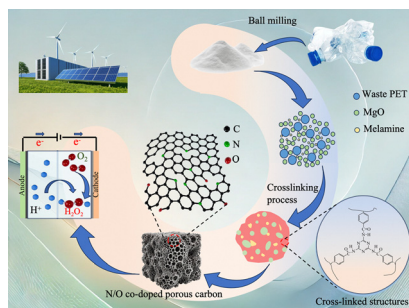
2833



### Cellulose nanofibril-based hybrid coatings with enhanced moisture barrier properties

Jingxuan Zhang and Jeffrey P. Youngblood\*

2845



### N/O co-doped porous carbon derived from polyester waste for electrochemical production of H<sub>2</sub>O<sub>2</sub>

Mingsheng Luo, Chupeng Wang, Shiqi Song, Maochong Tang, Xiao Xia Wang\* and Min Wu

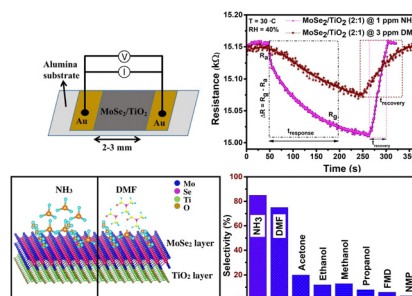


## PAPERS

2854

# MoSe<sub>2</sub>-based room temperature gas sensor with a sub-parts-per-billion limit for ammonia and *N,N*-dimethylformamide

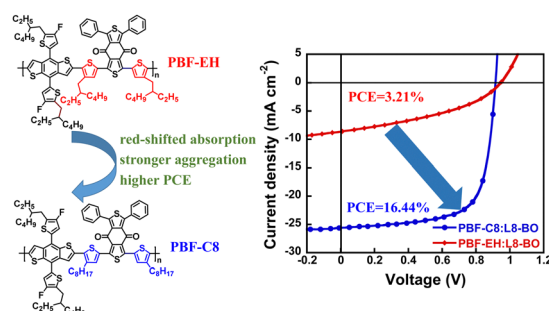
Virendra Singh Choudhary, Ramandeep Singh, Ashok Kumar, C. S. Yadav, Sandeep Sharma, Joel Garcia\* and Surender Kumar Sharma\*



2867

# Side-chain engineering to develop phenyl-substituted benzodithiophenedione-unit-based polymer donors for efficient non-fullerene polymer solar cells

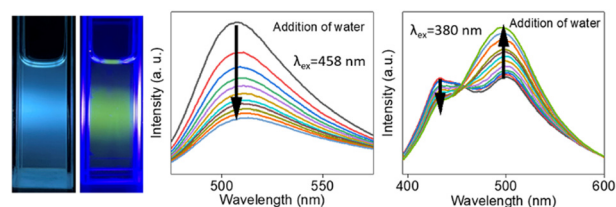
Baitian He, WenZheng Zhang, Jinming Zhang, Yan Liu,\* Guiting Chen,\* Manjun Xiao\* and Chuanbo Dai



2875

# Fluorescent carbon dots with dual emissions and solvent-dependent properties for water detection in organic solvents

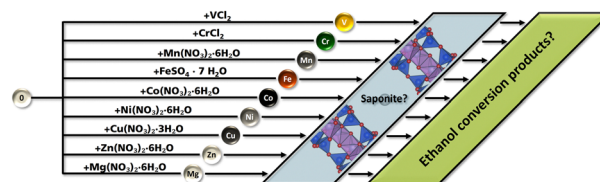
Koki Sekioka, Nazanin Mosleh, Dan Boice, Richard Hailstone and Xiangcheng Sun\*



2885

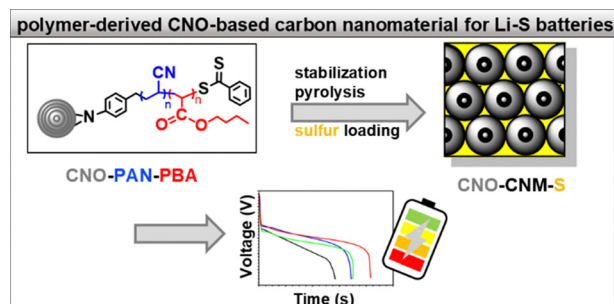
# The conversion of ethanol over 3d-metal saponite-like smectites

Marc Greuel, Clara Maria Watermann, Heiko Lohmann, Stefan Kaluza, Ulf-Peter Apfel\* and Barbara Zeidler-Fandrich\*





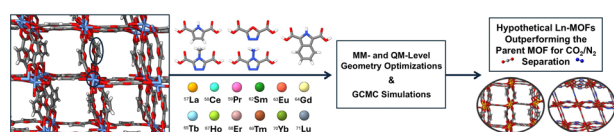
2899



## Polymer-derived N-doped carbon nanomaterials containing carbon nano-onions and their potential applicability

Agnieszka Hryniewicka,\* Joanna Breczko, Gabriela Siemiaszko, Karolina H. Markiewicz, Agnieszka Gabryelczyk, Grzegorz Lota and Marta E. Plonska-Brzezinska\*

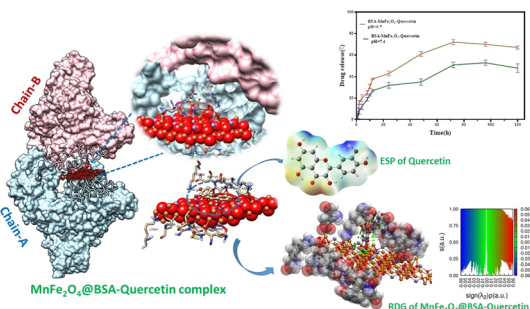
2911



## Rational design of lanthanide-based metal-organic frameworks for CO<sub>2</sub> capture using computational modeling

Zeynep Pinar Haslak, Hasan Can Gulbalkan and Seda Keskin\*

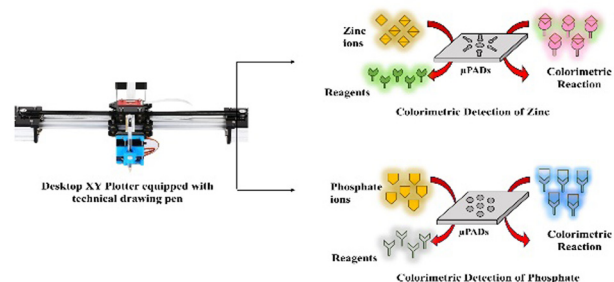
2925



## An integrated computational and experimental study of BSA-coated MnFe<sub>2</sub>O<sub>4</sub> nanoparticles as a drug delivery platform for quercetin

Negin Hashemi, Shabnam Naderlou, Ali Mohammadi and Hossein Danafar\*

2942



## Empowering agriculture: rapid on-site soil nutrient detection with microfluidic colorimetry

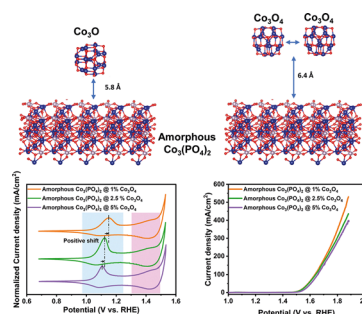
Piyush Mishra, Priyanshi Gupta, Sadhak Khanna, Bhupendra Pratap Singh, Pallavi Mishra, Swapnil Srivastava, Sapna Yadav, Sneha Kadian, Shug-June Hwang and Ved Varun Agrawal\*



2956

### Charge redistribution induced by well-dispersed cobalt oxide nanoparticles on $\text{Co}_3(\text{PO}_4)_2$ surfaces enhances OER catalytic activity

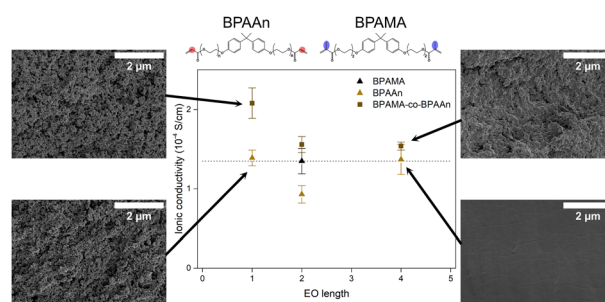
Abdelhadi El Jaouhari, Jamal Bencaid, Anouar Belhboub, Mustapha Matrouf, Ikram Cheras, Jinhua Zhu, Bouchaib Manoun and Fouad Ghamouss\*



2967

### Effect of monomer composition on the formation of hybrid polymer-liquid electrolytes for lithium-ion batteries

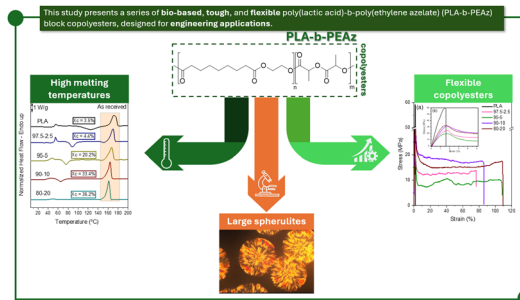
Samuel Emilsson, Gabriele Maffei, Martina Cattaruzza and Mats Johansson\*



2975

### Novel biobased, flexible blocky copolyesters based on poly(lactic acid) and poly(ethylene azelate)

Rafail O. Ioannidis, Zoe Terzopoulou,\* Alexandra Zamboulis, Nikolaos D. Bikiaris, Michiel Jan Noordam and Nikolaos Nikolaidis\*



2990

### Exploring a new synthesis route to lithium-excess disordered rock salt (DRX) cathode materials

Matthew S. Chambers,\* Tianyu Li, Zhilin Liang, Jong Keum, Kevin H. Stone, Raphaële J. Clément, Beth L. Armstrong\* and Ethan C. Self\*

