

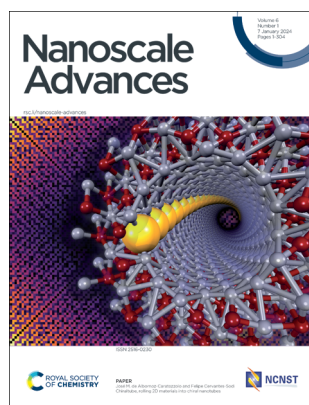
# Nanoscale Advances

An open access journal publishing across the breadth of nanoscience and nanotechnology  
[rsc.li/nanoscale-advances](https://rsc.li/nanoscale-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.

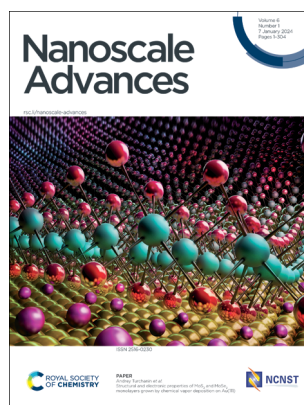
## IN THIS ISSUE

ISSN 2516-0230 CODEN NAADAI 6(1) 1–304 (2024)



### Cover

See José M. de Albornoz-Caratozzolo and Felipe Cervantes-Sodi, pp. 79–91. Image reproduced by permission of Felipe Cervantes-Sodi from *Nanoscale Adv.*, 2024, 6, 79.



### Inside cover

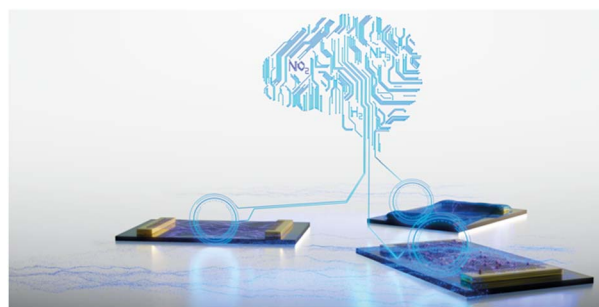
See Andrey Turchanin *et al.*, pp. 92–101. Image reproduced by permission of Andrey Turchanin and Friedrich Schiller University Jena from *Nanoscale Adv.*, 2024, 6, 92.

## REVIEWS

11

### Graphene-based chemiresistive gas sensors

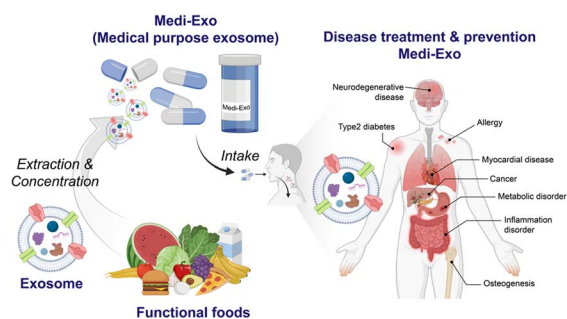
Patrick Recum and Thomas Hirsch\*



32

### The emerging role of medical foods and therapeutic potential of medical food-derived exosomes

Jin-Young Hur, SeonHyung Lee, Woo-Ri Shin, Yang-Hoon Kim\* and Ji-Young Ahn\*



# Royal Society of Chemistry approved training courses

Explore your options.  
Develop your skills.  
Discover learning  
that suits you.

**Courses in the classroom,  
the lab, or online**

Find something for every  
stage of your professional  
development. Search our  
database by:

- subject area
- location
- event type
- skill level

Members **get at least 10% off**

Visit [rsc.li/cpd-training](https://rsc.li/cpd-training)

**SAVE  
10%**

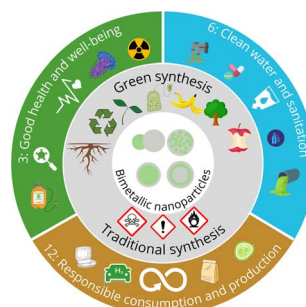


## REVIEWS

51

## Green synthesis trends and potential applications of bimetallic nanoparticles towards the sustainable development goals 2030

Mariana Larrañaga-Tapia, Benjamín Betancourt-Tovar, Marcelo Videia, Marilena Antunes-Ricardo and Jorge L. Cholula-Díaz\*

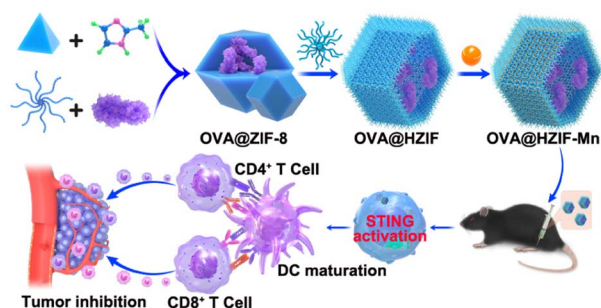


## COMMUNICATION

72

## Hollow metal–organic framework-based, stimulator of interferon genes pathway-activating nanovaccines for tumor immunotherapy

Yilei Zhao, Ruinan Song, Zhen Zhang, Houyang Hu, Wenli Ning, Xiuying Duan, Jianwei Jiao,\* Xiao Fu\* and Guiqiang Zhang\*

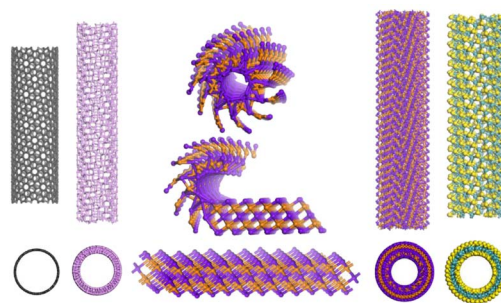


## PAPERS

79

## Chiraltube, rolling 2D materials into chiral nanotubes

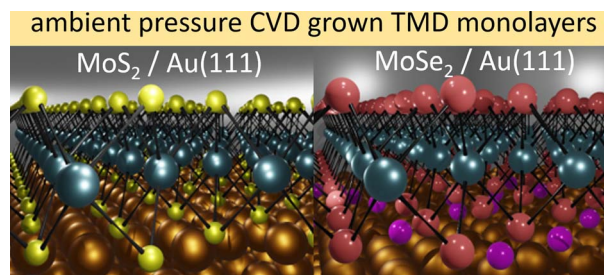
José M. de Albornoz-Caratozzolo and Felipe Cervantes-Sodi\*



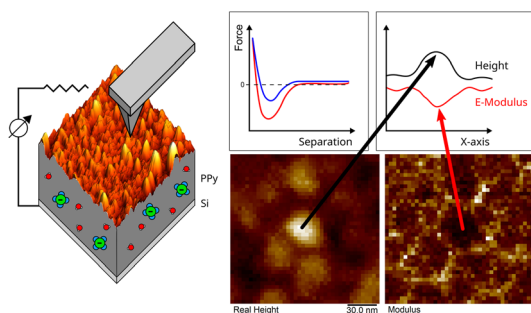
92

## Structural and electronic properties of MoS<sub>2</sub> and MoSe<sub>2</sub> monolayers grown by chemical vapor deposition on Au(111)

Julian Picker, Maximilian Schaal, Ziyang Gan, Marco Gruenewald, Christof Neumann, Antony George, Felix Otto, Roman Forker, Torsten Fritz and Andrey Turchanin\*



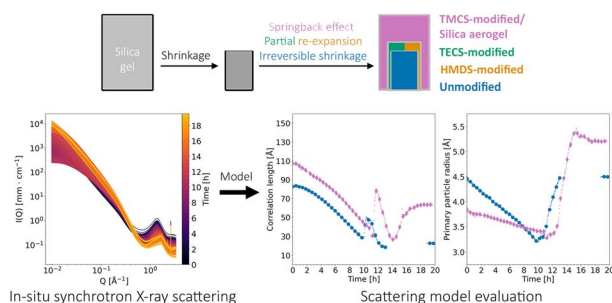
102



### Mapping the nanoscale elastic property modulations of polypyrrole thin films in liquid electrolyte with EC-AFM

Alexander Meinhardt,<sup>\*</sup> Pirmin Lakner, Patrick Huber and Thomas F. Keller<sup>\*</sup>

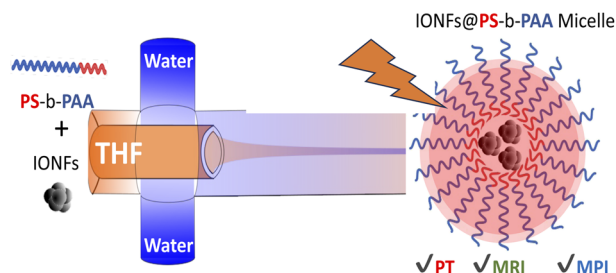
111



### Springback effect of ambient-pressure-dried silica aerogels: nanoscopic effects of silylation revealed by *in situ* synchrotron X-ray scattering

Fabian Zemke,<sup>\*</sup> Ernesto Scoppola,<sup>\*</sup> Ulla Simon, Maged F. Bekheet, Wolfgang Wagermaier and Aleksander Gurlo

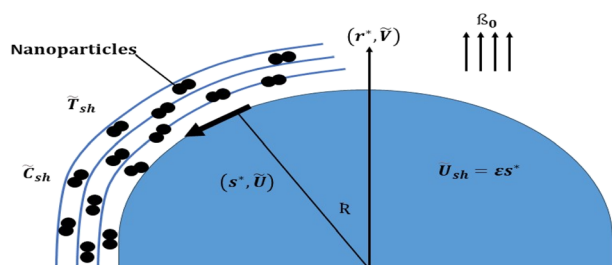
126



### High-throughput large scale microfluidic assembly of iron oxide nanoflowers@PS-*b*-PAA polymeric micelles as multimodal nanoplatforms for photothermia and magnetic imaging

Emilia Benassai, Ana C. Hortelao, Elif Aygun, Asli Alpman, Claire Wilhelm, Emine Ulku Saritas and Ali Abou-Hassan<sup>\*</sup>

136



### Overview of solar thermal applications of heat exchangers with thermophysical features of hybrid nanomaterials

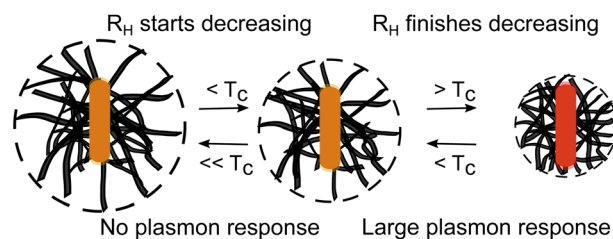
Muhammad Naveed Khan, F. M. Aldosari, Zhentao Wang,<sup>\*</sup> Muhammad Yasir, Mohammad Afikuzzaman and Ibrahim E. Elseesy



146

### Correlating structural changes in thermoresponsive hydrogels to the optical response of embedded plasmonic nanoparticles

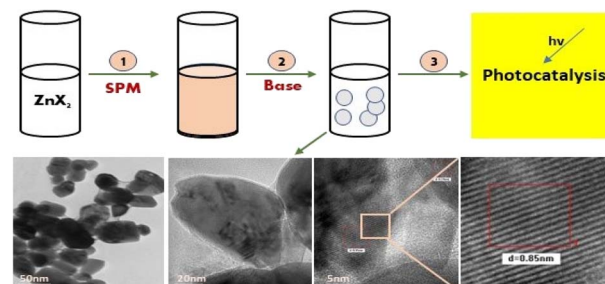
Kamila Zygadlo, Chung-Hao Liu, Emmanuel Reynoso Bernardo, Huayue Ai, Mu-Ping Nieh and Lindsey A. Hanson\*



155

### Phase controlled green synthesis of wurtzite (P63mc) ZnO nanoparticles: interplay of green ligands with precursor anions, anisotropy and photocatalysis

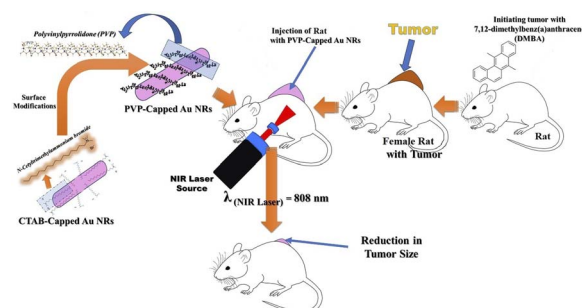
Lahur Mani Verma, Ajay Kumar, Aejaz Ul Bashir, Upanshu Gangwar, Pravin P. Ingole and Satyawati Sharma\*



170

### A new vision of photothermal therapy assisted with gold nanorods for the treatment of mammary cancers in adult female rats

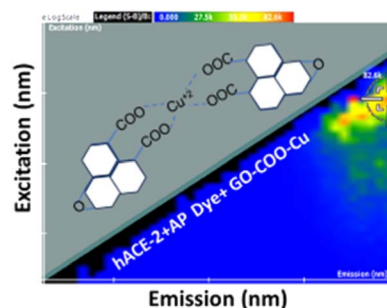
Hend Gamal,\* Walid Tawfik, Hassan IH El-Sayyad, Ahmed N. Emam, Heba Mohamed Fahmy and Heba A. El-Ghaweet



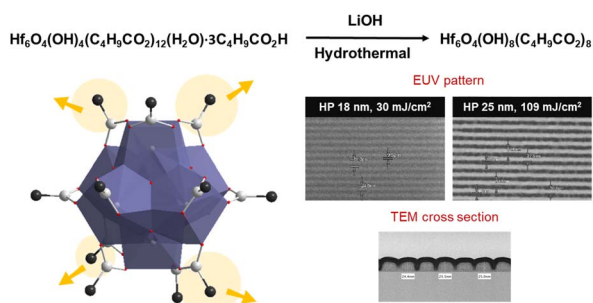
188

### Synthetic graphene–copper nanocomposites interact with the hACE-2 enzyme and inhibit its biochemical activity

Shoukath Sulthana, Abeera Bhatti, Elza Mathew, Sohail H. Quazi, Natasha N. Gaudreault,\* Robert DeLong\* and Santosh Aryal\*



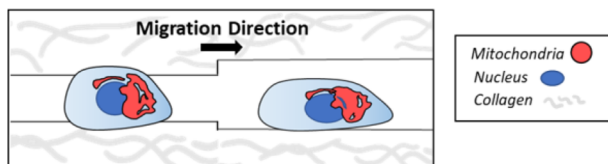
197



### Highly hydroxylated hafnium clusters are accessible to high resolution EUV photoresists under small energy doses

Yu-Fang Tseng, Pin-Chia Liao, Po-Hsiung Chen,<sup>\*</sup> Tsai-Sheng Gau,<sup>\*</sup> Burn-Jeng Lin, Po-Wen Chiu and Jui-Hsiung Liu<sup>\*</sup>

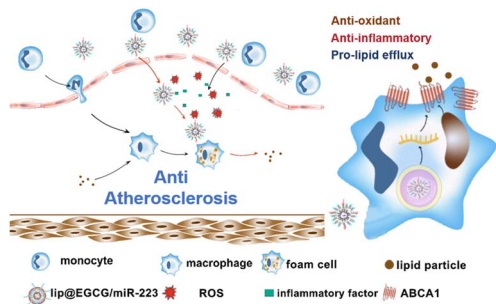
209



### Confinement primes cells for faster migration by polarizing active mitochondria

Jenna A. Mosier, Emily D. Fabiano, Catherine M. Ludolph, Addison E. White and Cynthia A. Reinhart-King<sup>\*</sup>

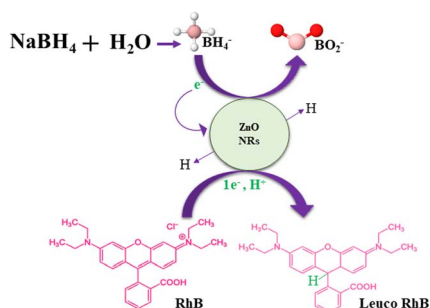
221



### Multifunctional liposomes Co-encapsulating epigallocatechin-3-gallate (EGCG) and miRNA for atherosclerosis lesion elimination

Dandan Li, Danni Liu, Yaoqi Wang, Qi Sun, Ran Sun, Jie Zhang, Xiaoxuan Hong, Ran Huo, Shuang Zhang<sup>\*</sup> and Chunying Cui<sup>\*</sup>

233



### Carbon sphere doped CdS quantum dots served as a dye degrader and their bactericidal behavior analysed with *in silico* molecular docking analysis

Muhammad Ikram,<sup>\*</sup> Misbah Naz, Ali Haider,<sup>\*</sup> Iram Shahzadi, Hafiz Umar Mehboob, Muhammad Ahsaan Bari, Anwar Ul-Hamid, Mohammed M. Algaradah and Murefah mana Al-Anazy

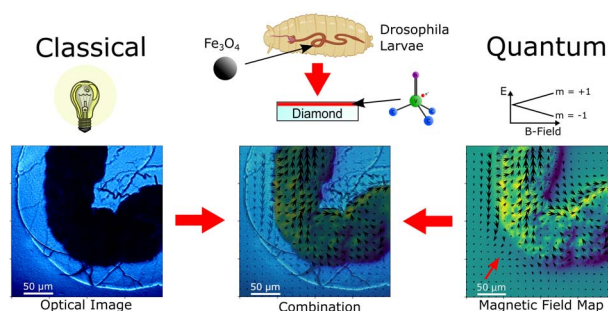


## PAPERS

247

### Nitrogen-vacancy center magnetic imaging of $\text{Fe}_3\text{O}_4$ nanoparticles inside the gastrointestinal tract of *Drosophila melanogaster*

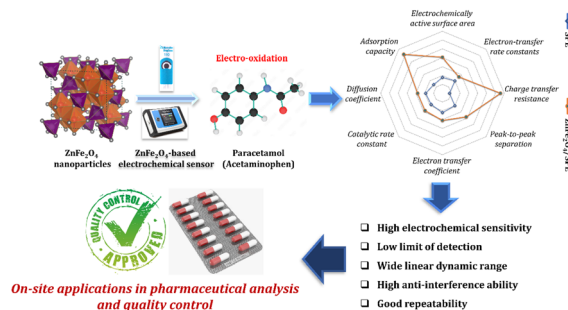
Niklas Mathes,\* Maria Comas, Regina Bleul, Katrijn Everaert, Tobias Hermle, Frank Wiekhorst, Peter Knittel, Ralph A. Sperling and Xavier Vidal\*



256

### An on-site and portable electrochemical sensing platform based on spinel zinc ferrite nanoparticles for the quality control of paracetamol in pharmaceutical samples

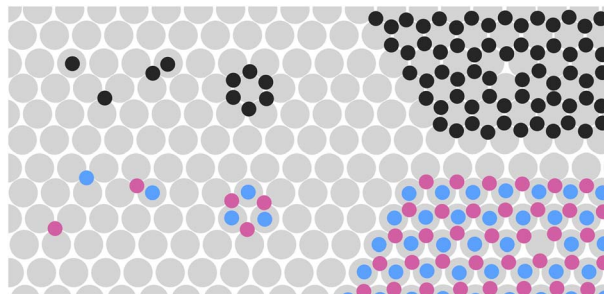
Nguyen Tuan Anh,\* Le Minh Tung,\* Le Khanh Vinh, Nguyen Van Quy, Ong Van Hoang, Ngo Xuan Dinh and Anh-Tuan Le\*



268

### Growing $\text{sp}^2$ materials on transition metals: calculated atomic adsorption energies of hydrogen, boron, carbon, nitrogen, and oxygen atoms, $\text{C}_2$ and BN dimers, $\text{C}_6$ and $(\text{BN})_3$ hexamers, graphene and h-BN with and without atomic vacancies

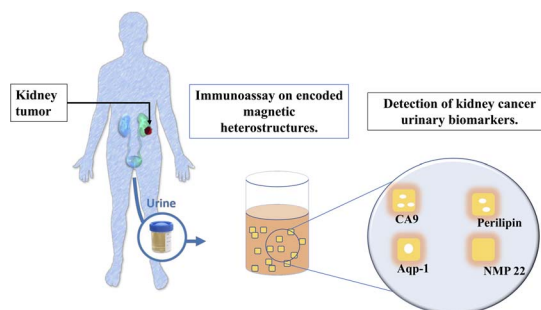
Ari Paavo Seitsonen\* and Thomas Greber\*

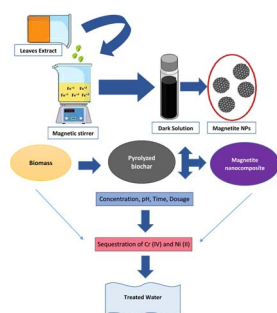


276

### Lithographically defined encoded magnetic heterostructures for the targeted screening of kidney cancer

Selma Leulmi Pichot, Tarun Vemulkar, Jeroen Verheyen, Lauren Wallis, James O. Jones, Andrew P. Stewart, Sarah J. Welsh, Grant D. Stewart and Russell P. Cowburn





## Sequestration of chromium(vi) and nickel(ii) heavy metals from unhygienic water via sustainable and innovative magnetic nanotechnology

Noor Zulfiqar,<sup>\*</sup> Monireh Shariatipour and Fawad Inam

