

# Materials Advances

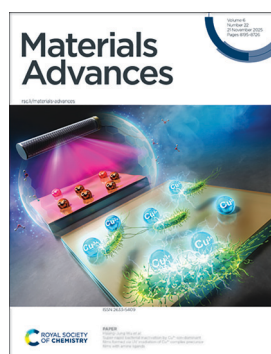
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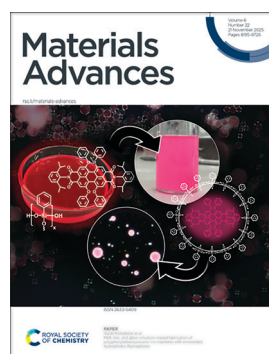
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ISSN 2633-5409 CODEN MAADC9 6(22) 8195-8726 (2025)



### Cover

See Hsiang-Jung Wu *et al.*, pp. 8370–8378. Image reproduced by permission of Hiroki Nagai from *Mater. Adv.*, 2025, 6, 8370. Image created by Takashi Tsujino.



### Inside cover

See Guido Kickelbick *et al.*, pp. 8379–8392. Image reproduced by permission of Guido Kickelbick from *Mater. Adv.*, 2025, 6, 8379.

## EDITORIAL

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### Advances in energy generation and conversion technologies

Shiv Singh, Bo Weng, Pradip Kumar, Neeraj Dwivedi and Akshay Modi

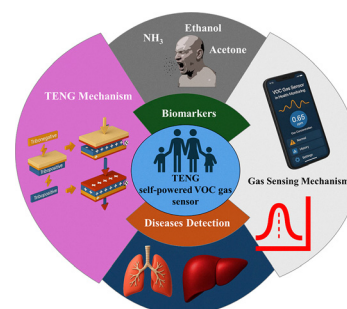


## REVIEWS

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### Advances in nanogenerator enabled smart mask-based self-powered health monitoring units

Mohamed A. Belal, Swati Panda, Udaykumar Khanapuram,\* Sugato Hajra,\* Kushal Ruthvik Kaja, Rakesh Kumar Rajaboina, Venkateswaran Vivekananthan, Naratip Vittayakorn and Hoe Joon Kim\*



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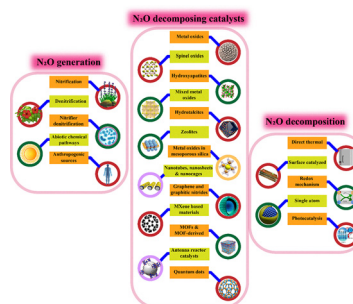
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## REVIEWS

8239

### Insights into N<sub>2</sub>O decomposition in environmental catalysis: evaluation and an advanced outlook

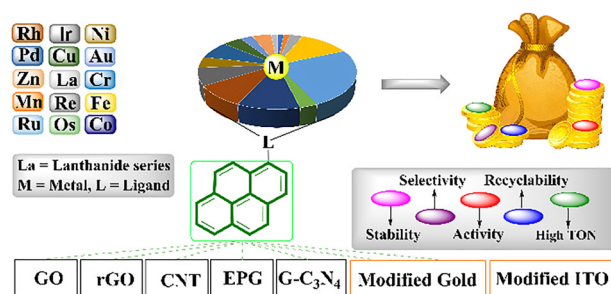
Khezina Rafiq, Mamoona Sabir, Iqra Sadia, Muhammad Zeeshan Abid, Muhammad Arif Nadeem and Ejaz Hussain\*



8277

### Immobilization of pyrene-tagged metal complexes onto solid supports by $\pi$ -stacking interactions: syntheses and applications

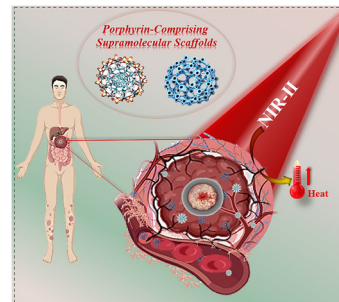
Elham Sanaei and Gholamhossein Mohammadnezhad\*



8337

### An overview of porphyrin-comprising supramolecular scaffolds for cancer phototherapy

Fatemeh Ganjali, Saminalasadat Sehat, Sepide Azadegan, Maryam Saidi Mehrabad, Leila Chooapani and Ali Maleki\*

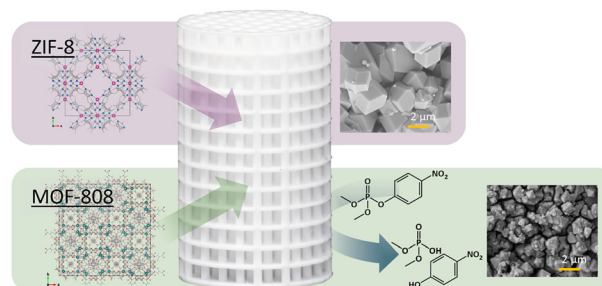


## COMMUNICATION

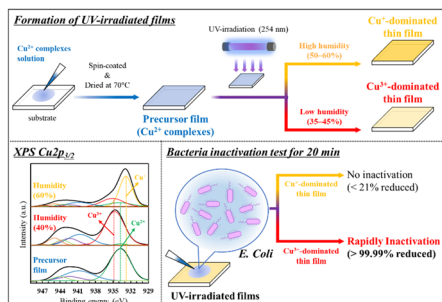
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### High-temperature sintered 3D-printed alumina as mechanically robust supports for MOF catalysis

Flora Schöfbeck, Tanja Eder, Wenyi Zeng, Dominik Brouczek, Martin Schwentenwein, Youven Benseghir, Michael R. Reithofer\* and Jia Min Chin\*



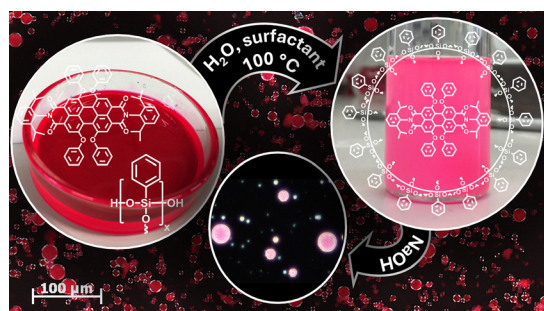
8370



### Super-rapid bacterial inactivation by $\text{Cu}^{3+}$ -ion-dominant films formed via UV irradiation of $\text{Cu}^{2+}$ complex precursor films with amine ligands

Hsiang-Jung Wu, Takashi Douura, Shota Takamiya, Koji Yoshikawa, Kenjiro Sugiyama, Mitsunobu Sato and Hiroki Nagai\*

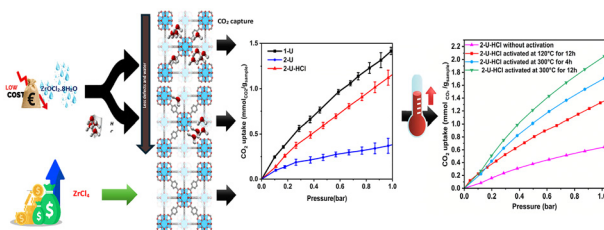
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### Melt, mix, and glow: emulsion-based fabrication of polyphenylsilsesquioxane microspheres with embedded hydrophobic fluorophores

Svenja Pohl, Nils Steinbrück, Michal P. Pachnicz and Guido Kickelbick\*

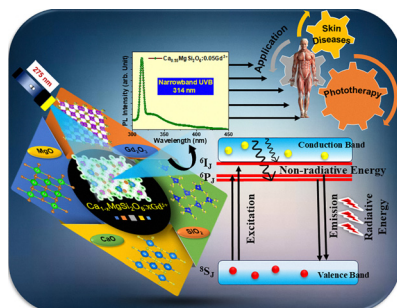
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### HCl-assisted fabrication of metal-organic framework UiO-66(Zr) for affordable gas capture

Zineb Ouzrou, El Mehdi Moumen, Ran Eitan Abutbul, Daniel Lee, Marta Falkowska, Tausif Altamash, Samir El Hankari and Johan Jacquemin\*

8400



### Multimodal luminescence and energy transfer mechanism in a narrowband UVB emitting phosphor system towards futuristic phototherapeutic devices

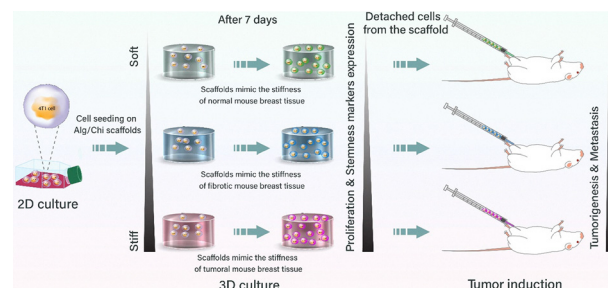
Achal A. Sharma, Payal P. Pradhan, K. A. K. Durga Prasad, M. Rakshita, Raju Pembarthi and D. Haranath\*



8414

## Tumor matrix stiffness drives malignant progression in murine breast cancer: enhanced stemness, tumorigenesis and metastasis

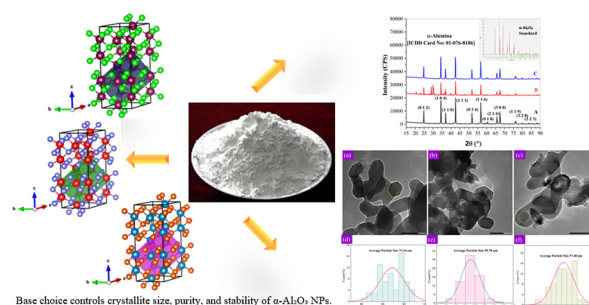
Sadegh Safaei, Samane Heydari, Masoumeh Dehghan Manshadi, Behnaz Ashtari, Mazaher Gholipourmalekabadi, Farhang Sasani, Farideh Hashemi, Mehran Vosoogh, Zahra Madjd\* and Roya Ghods\*



8431

## Sustainable synthesis of $\alpha$ -alumina nanoparticles: a comparative study of base-mediated crystallization via co-precipitation

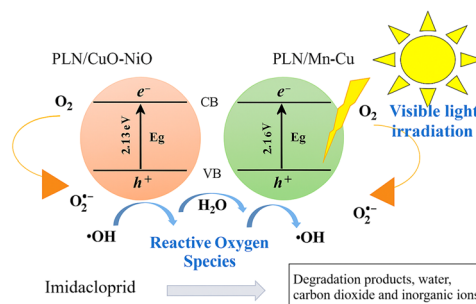
Fariha Zannat, Md. Ashrafal Alam, Pulak Ghosh, Raton Kumar Bishwas\* and Shirin Akter Jahan\*



8448

## Design and optimization of polyindole-integrated bimetallic composites (PLN/CuO–NiO and PLN/Mn–Cu) for efficient photocatalytic degradation of imidacloprid under sunlight irradiation

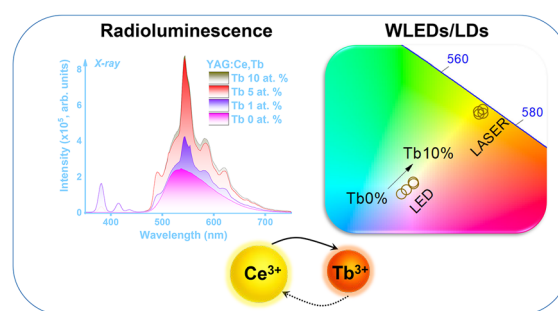
Muhammad Imran, Amina Khan, Raheeba Akbar, Haq Nawaz Bhatti,\* Norah Alwadai and Munawar Iqbal\*



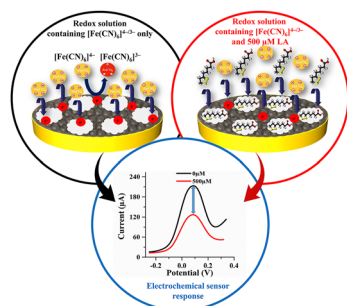
8464

## Tb<sup>3+</sup> and Ce<sup>3+</sup> as a functional couple for enhanced luminescence in YAG ceramics for X-ray imaging and high-power white LEDs and laser diodes

Anton Markovskiy,\* Warut Chewpraditkul, Przemysław Gołębiowski, Paweł Socha, Helena Węglarz, Agnieszka Szysiak, Vitezslav Jary, R. Kučerková, Robert Tomala, Akira Yoshikawa, Shunshuke Kurosawa, Ryszard Buczyński, Weerapong Chewpraditkul and Karol Bartosiewicz\*



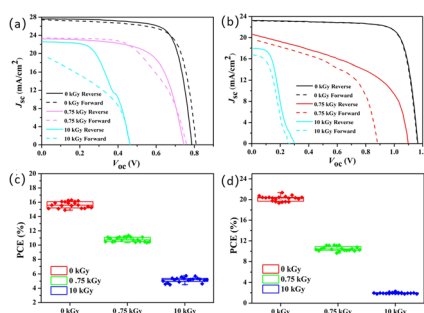
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### Molecularly imprinted sensor for lipoic acid quantification in serum: a proof-of-concept for diagnosis of NELL-1 membranous nephropathy and kidney failure

Kanwal Bashir, Amir Habib, Imran Shakir, Tajamal Hussain and Adeel Afzal\*

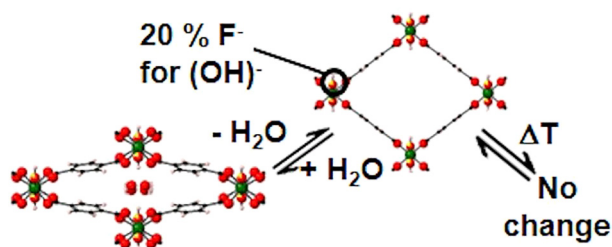
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### Comparative study on radiation resistance of tin–lead and pure lead perovskite solar cells

Longlong Zhang, Shiqi Li,\* Yinghao Wang, Hongwei Li, Rui Chen,\* Xiang Zhu, Xiaoheng Xu, Yuying Hao and Yingqi Ma\*

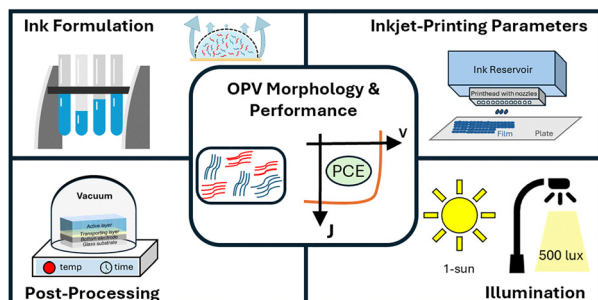
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### Synthesis and breathing behaviour of a new member of the fluoride-substituted gallium MIL-53 metal–organic framework solid-solution series

A. R. Bonity J. Lutton-Gething, Ruxuan Lan, Yongkang Huang, Thomas J. Duddles, Carlo Bawn, Daniel Lee, George F. S. Whitehead and Martin P. Attfield\*

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### Process and design guidelines for inkjet-printed organic photovoltaic cells – using the example of PM6:Y6

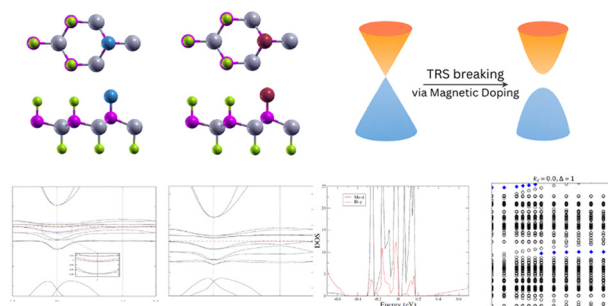
Tsu-yu Chou, Tanmay Sinha, Xueshi Jiang, Ekimsu Akdoğan, Bernhard Siegmund, Martin Rosenthal, Koen Vandewal and Francisco Molina-Lopez\*



8520

### First-principles study of transition-metal doped GaBiCl<sub>2</sub> monolayers as magnetic topological insulators

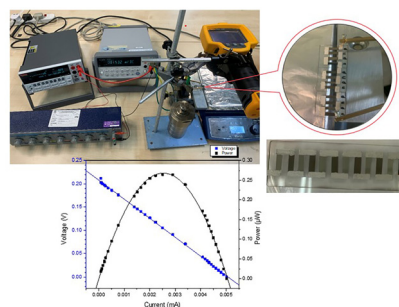
Sophia Ren\* and Xuan Luo



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### Performance improvement of a thin film thermoelectric generator *via* optimisation of the deposition parameters

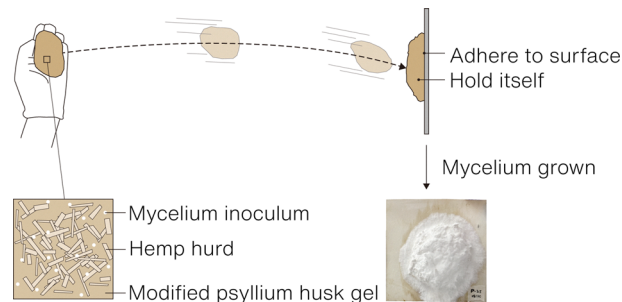
Nurfarhana Ahmad Musri,\* Yoganash Putthisigamany, Puvaneswaran Chelvanathan, Nadhrah Md Yatim, Farah Liana Mohd Redzuan and Ubaidah Syafiq\*



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### Engineering shootable mycelium-bound composites (MBCs) as living building materials

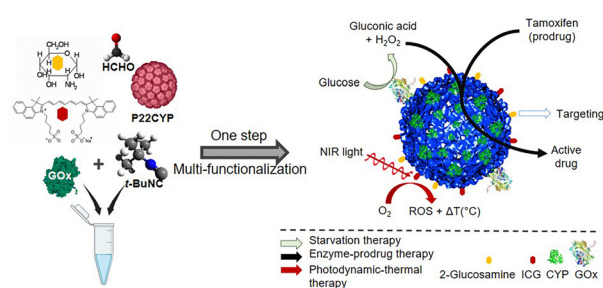
Xue Brenda Bai, Ellen W. van Wijngaarden, Meredith N. Silberstein\* and Marta H. Wisniewska\*



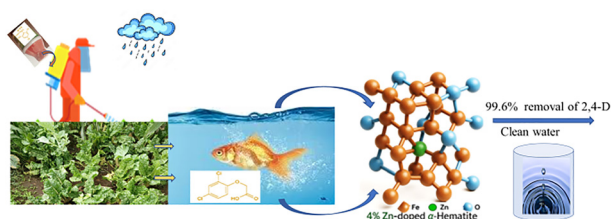
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### Ugi reaction-enabled one-step multifunctionalization of biocatalytic VLPs for multimodal therapeutics

Andrea Dorado-Baeza, Daniel Pliego Sosa, Ana G. Rodríguez-Hernández, Prakhar Sengar, Rafael Vazquez-Duhalt and Kanchan Chauhan\*



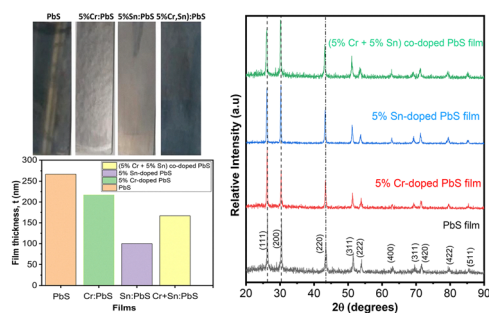
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### Modifying the electronic structure of hematite to be an efficient adsorbent for the removal of 2,4-dichlorophenoxyacetic acid from water and food samples

Befkad Tedla Belayneh, Bekele Getahun, Taame Abraha Berhe, Belete Asefa Aragaw, Zerihun Getaneh Workneh and Amare Aregahegn Dubale\*

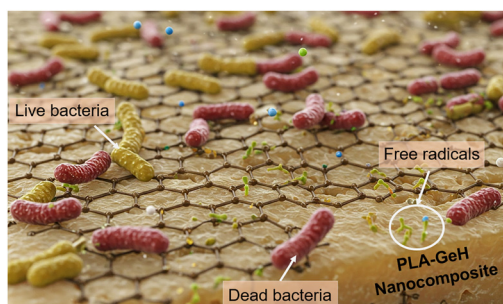
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### Low-cost synthesis and comprehensive characterization of Cr<sup>3+</sup> and Sn<sup>2+</sup> co-doped lead sulfide thin films for optoelectronic applications

Athar Javed,\* Muhammad Abdul Wahab, Muhammad Bashir, Mashkoor Ahmad, Syed Hussnain Haider Sherazi and Shanza

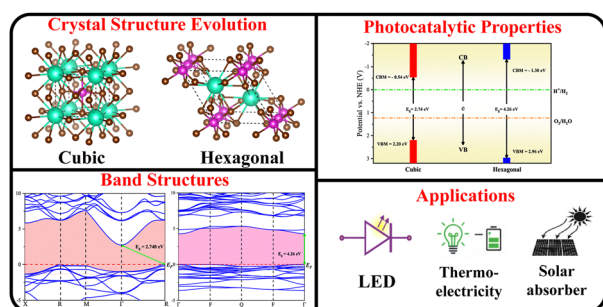
8602



### 2D-Germanane-reinforced poly(lactic acid): nanocomposites with enhanced antioxidative and antibacterial activity

Theodosios Giousis, Zoi Terzopoulou,\* Maria-Eirini Grigora, Dimitrios Moschovas, Stamatia Spyrou, Renia Fotiadou, Haralambos Stamatias, Apostolos Avgeropoulos, Dimitrios Tzetzis, Dimitrios P. Gournis, Dimitrios N. Bikiaris and Petra Rudolf\*

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### Unveiling phase dependent physical properties of cubic and hexagonal CsCdBr<sub>3</sub>: a DFT approach

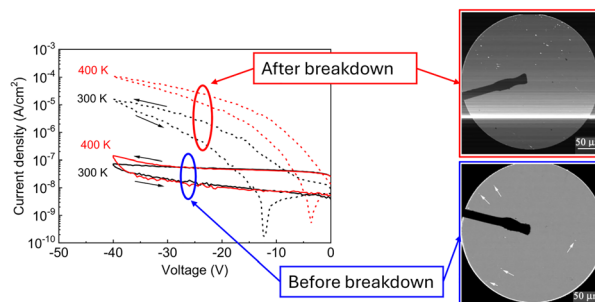
Arpon Chakraborty,\* M. N. H. Liton, Mst. Halima Khatun and Md. Shahjahan



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### Deep traps in Ga<sub>2</sub>O<sub>3</sub> Schottky diodes induced by soft electric breakdown

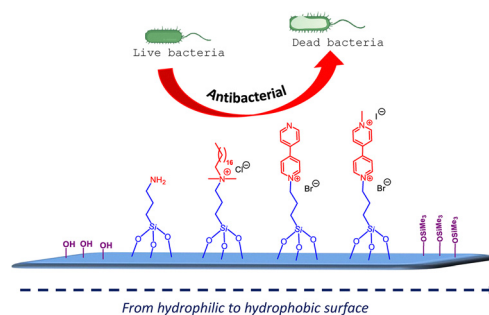
Alexander Y. Polyakov, Ivan Shchemerov, Eugene B. Yakimov, Alexey Chernykh, Sergey Chernykh, Anton Vasilev, Nikolai Matros, Andei Romanov, Luiza Alexanyan, Eugene E. Yakimov and Stephen J. Pearton\*



8645

### Antibacterial nitrogen-containing mesostructured SBA-15-type materials: insight into functional groups and surface polarity

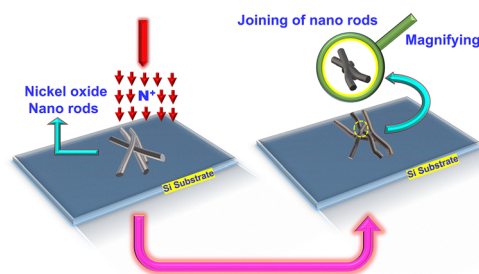
Mohamed Amine Benzaouia, Othmane Dardari, Ghanem Hamdoun, Nadia Katir and Abdelkrim El Kadib\*



8657

### Defect engineered nickel oxide nanorods by low energy nitrogen ion exposure for supercapacitor applications

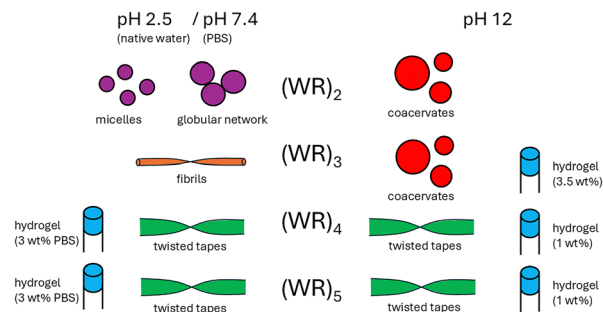
Arpita Patro, Satyanarayan Dhal,\* Manoj K. Rajbhar, Durga Madhab Pani, Shyamal Chatterjee, Sithara Radhakrishnan and Chandra Sekhar Rout\*



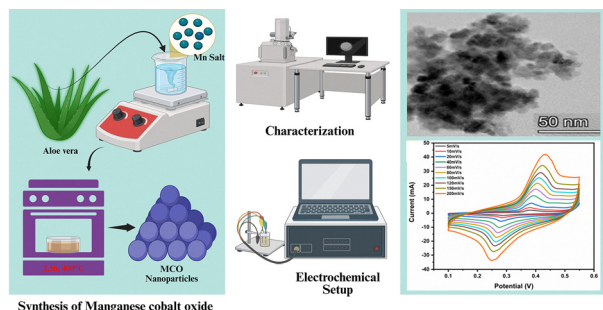
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### Fibrillization versus coacervation in arginine–tryptophan repeat peptides: effects of sequence length and pH

Valeria Castelletto, Lucas de Mello, Jani Seitsonen and Ian W. Hamley\*



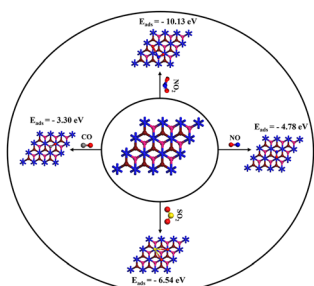
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### Aloe vera-assisted synthesis of $\text{MnCo}_2\text{O}_4$ as a battery-type material for hybrid supercapacitor applications

Mohit Bhatt,\* Kajal Gautam and Anil Kumar Sinha\*

8701

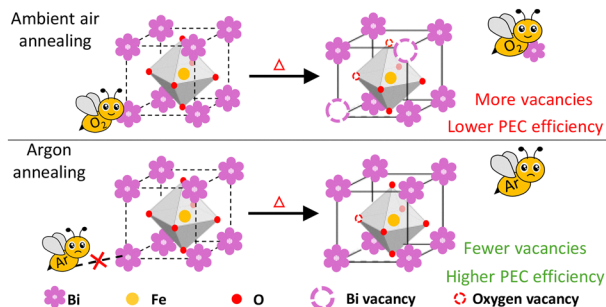


Toxic gases (CO, NO,  $\text{NO}_2$ , and  $\text{SO}_2$ ) adsorbed on the  $\text{HfZrN}$  Surface.

### DFT insights into the gas sensing performance of $\text{M}_2\text{X}$ ( $\text{M} = \text{Zr}, \text{Hf}$ ; $\text{X} = \text{C}, \text{N}$ ) MXenes and their Janus derivatives for toxic gases

Muhitul Islam, Siraj Ud Daula Shamim,\*  
Bivas Kumar Dash, Aditi Ahmed Ananna,  
Mohammad Sadiqur Rahman, Tanu Arefin and  
Afiya Akter Piya

8713



### The origin of annealing atmosphere-dependent defect formation and photocathodic behaviour in $\text{BiFeO}_3$ thin films

Syeda Reha Khadri, N. V. Srihari, K. K. Nagaraja and  
Dharmapura H. K. Murthy\*

