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Nanoscale

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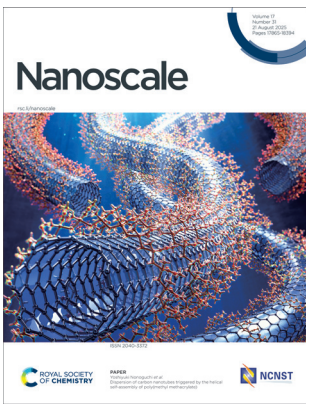
IN THIS ISSUE

ISSN 2040-3372 CODEN NANOHL 17(31) 17865–18394 (2025)



Cover
See Yoshiyuki Nonoguchi *et al.*, pp. 18105–18111.

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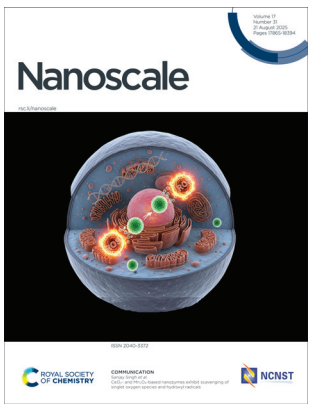

Inside cover
See Sanjay Singh *et al.*, pp. 18077–18082.

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EDITORIAL

17878

Advances and perspectives in nanoscale materials and optoelectronics

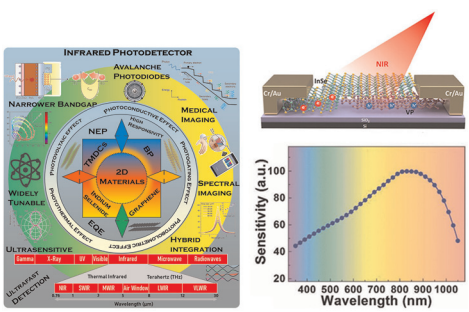
Christian Klinke

REVIEWS

17881

2D material-based infrared photodetectors: recent progress, challenges, and perspectives

Muhammad Wajid Zulfiqar, Sobia Nisar, Ghulam Dastgeer,* Muhammad Rabeel, Hammad Ghazanfar, Awais Ali, Muhammad Imran, Honggyun Kim and Deok-kee Kim*



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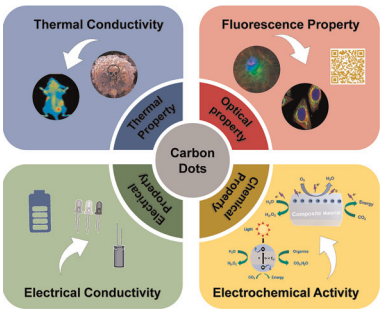
REVIEWS

17919

Carbon dots: translating versatile physicochemistry into multidisciplinary application frameworks

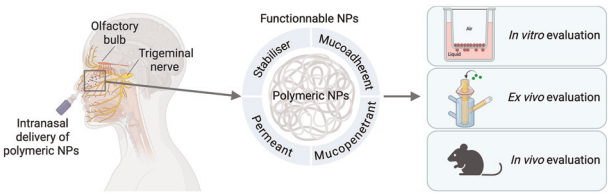
Chen Liu, Qi Feng, Yafeng Liu, Hao Liu,* Xuemei Wang* and Hui Jiang*



17947

Polymeric nanoparticles for efficient nose-to-brain delivery

Marie Bolon, Maxime Fieux, Claire Monge and Sophie Richard*



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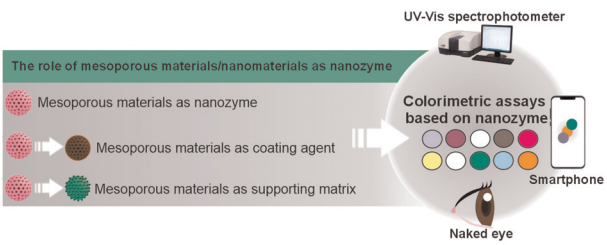
Recent advances in nanozymes based on mesoporous materials for enhancing the performance of colorimetric biosensors: Applications and challenges

Chou-Yi Hsu,* Rosull Saadoon Abbood, Ahmed Hussein Zwamel, Mohammad Y. Alshahrani, Subbulakshmi Ganesan, Jatin Sharma, Subhashree Ray, Rajesh Singh, Nooruldeen Ali Abdulhussein and Marwa Fadhil Alsaffar



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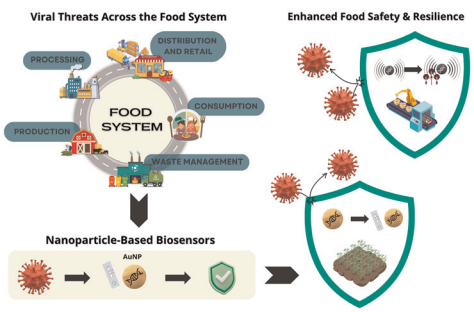
Nanoparticle-based biosensors for virus detection in food systems: from farm to fork

Riann Martin Sarza, Laura Sutarlie, Sam Fong Yau Li* and Xiaodi Su*



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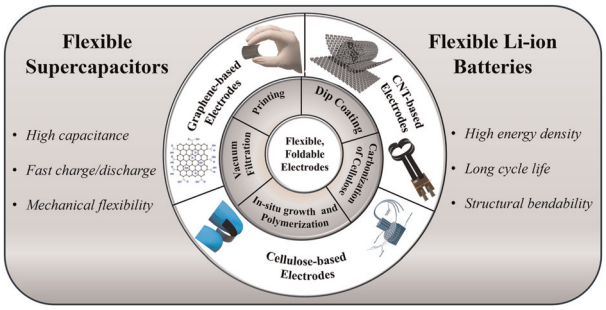
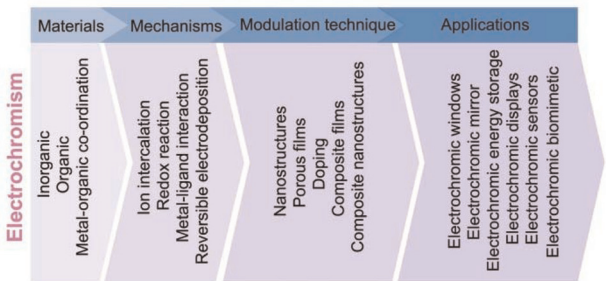


Flexible electrodes for high-performance energy storage: materials, conductivity optimization, and scalable fabrication

Muhammad Shoaib Tahir, Iqra Kainat, Hammad Ghazanfar and Young Soo Seo*

18049

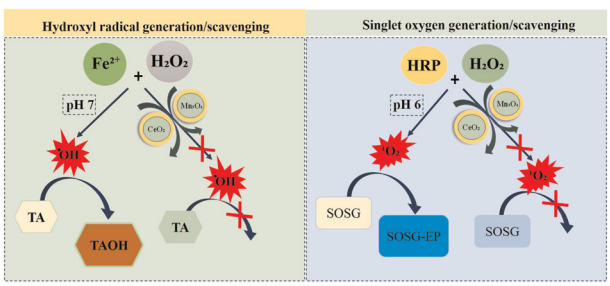


Materials, mechanisms, and emerging applications of electrochromic systems

Taimur Ahmed,* Aishani Mazumder, Sruthi Kuriakose, Aditya Dubey, Aaron Elbourne, Jiawen Ren, Vaishnavi Krishnamurthi, Everson Kandare, Irfan Haider Abidi, Enrico Della Gaspera, Sivacarendran Balendhran* and Sumeet Walia*

COMMUNICATIONS

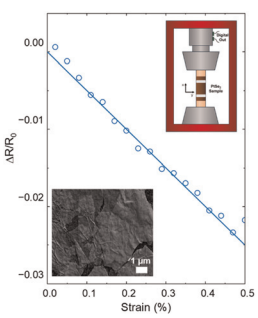
18077



CeO_2- and Mn_3O_4-based nanozymes exhibit scavenging of singlet oxygen species and hydroxyl radicals

Krishnendu M. R., Divya Mehta and Sanjay Singh*

18083



Solution-processed negative gauge factor $PtSe_2$ strain sensors

Cansu Ilhan, Eoin Caffrey, Shixin Liu, Jose Munuera, Zdeněk Sofer, Iva Plutnarová, Michael A. Morris, Jonathan N. Coleman* and Tian Carey*

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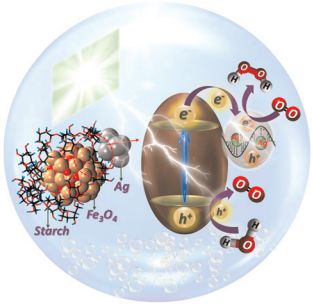
COMMUNICATIONS

18092

Silver nanostructure-loaded starch functionalized magnetite (Ag/s-Fe_3O_4) photocatalyst for H_2O_2 production: experimental and molecular dynamics studies

Uttam Kumar, Jyoti Kuntail, Shaili Pal, Mrinal R. Pai, Xenophon Krokidis, Andreas Bick and Indrajit Sinha*



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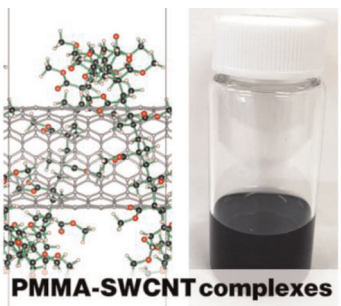
Dispersion of carbon nanotubes triggered by the helical self-assembly of poly(methyl methacrylate)

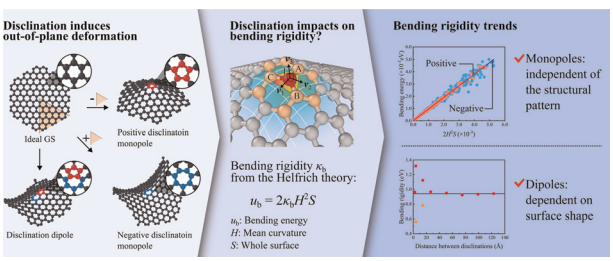
Ayaka D. Inoue, Kazuhiro Yoshida, Tsuyoshi Ando, Shuta Fukuura, Takashi Yumura, Hiroharu Ajiro, Tsuyoshi Kawai and Yoshiyuki Nonoguchi*



18112

A new computational approach for evaluating bending rigidity of graphene sheets incorporating disclinations

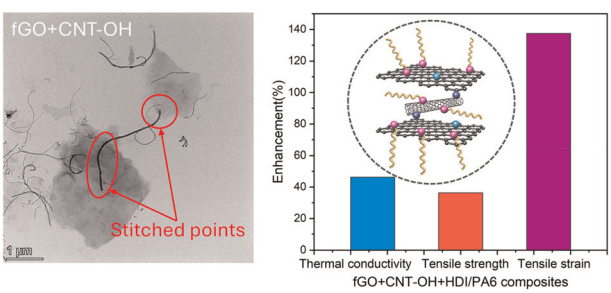
Yushi Kunihiro, Xiao-Wen Lei,* Takashi Uneyama and Toshiyuki Fujii



18127

Covalently bonded graphene oxide–carbon nanotube hybrid nanofillers for achieving high-performance polyamide 6 composites with superior mechanical properties and thermal conductivity

Guanjun Liu,* Yan Liu, Meng Zhang, Danyang Zhao, Ping Liu, Lu Wang, Lizhi Li and Meiling Yan*



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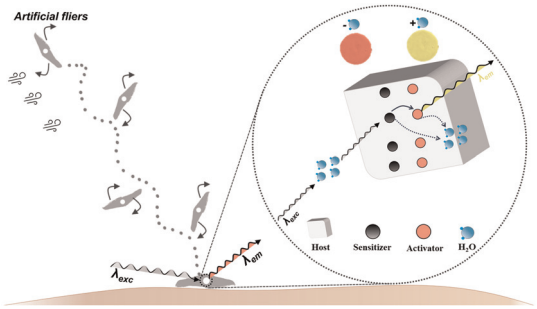

Sensing relative humidity with a fluorescent seed-like biodegradable flier

Albenc Nexha, Stefano Mariani, Kliton Cikalleshi, Thomas Kister, Barbara Mazzolai* and Tobias Kraus*

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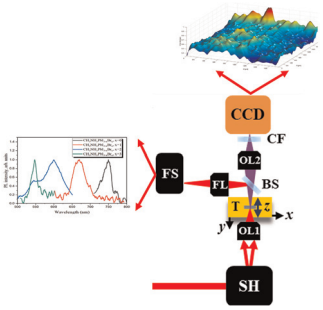
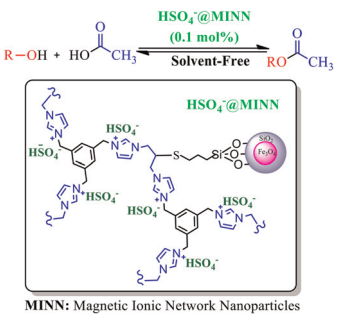


Novel microscopy based on simultaneous utilization of third harmonic generation and photoluminescence microscopy for thin film analysis and molecular detection

Mostafa A. Nasr,* Hamzeh Sabouni, Ganjaboy Boltaev and Ali S. Alnaser

18161



A magnetic hybrid sol–gel ionic network catalyst for direct alcohol esterification under solvent-free conditions

Maryam Faraji, Fariborz Mansouri,* Babak Karimi* and Hojatollah Vali

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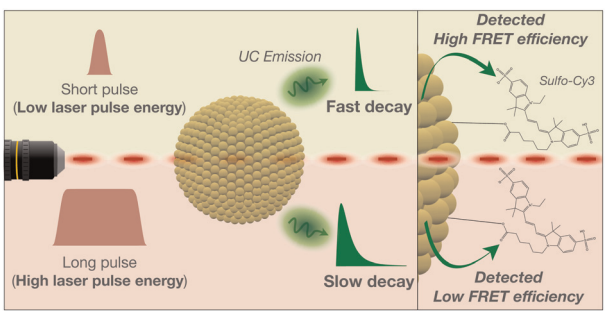

Influence of excitation pulse duration on the efficiency of upconversion nanoparticle-based FRET

Alejandro Casillas-Rubio, Khouloud Hamraoui, Diego Mendez-Gonzalez, Marco Laurenti, Jorge Rubio-Retama, Oscar G. Calderón* and Sonia Melle*

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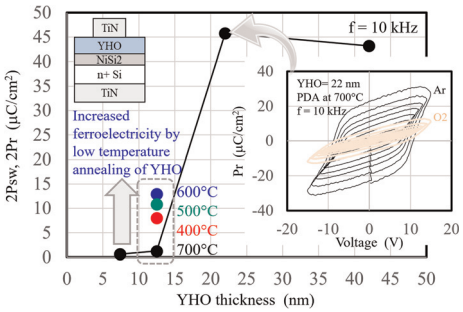
Ferroelectric recovery of scaled-down Y-doped HfO_2 thin films on $NiSi_2$ after annealing

Joel Molina-Reyes



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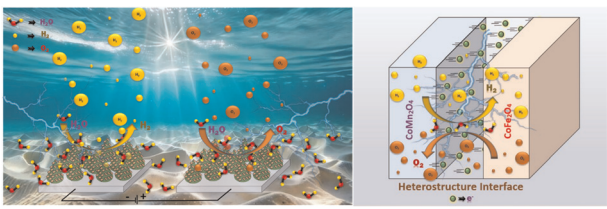
Heterostructure interface-engineered 3D/2D $CoMn_2O_4/CoFe_2O_4$/NF core/shell Bi-functional electrocatalytic nanomaterials for efficient overall water splitting application in alkaline media

Moorthy Krishnamachari, Mohanraj Kumar, Muthu Senthil Pandian and Jih-Hsing Chang*



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Field-induced demagnetisation of bisegmented cylindrical ferromagnetic nanowires mediated by skyrmion tubes

João Fradet,* Victor Vega, Yolanda Álvarez, Javier García, Cristina Bran, Victor M. Prida, Agustina Asenjo and Oksana Chubykalo-Fesenko

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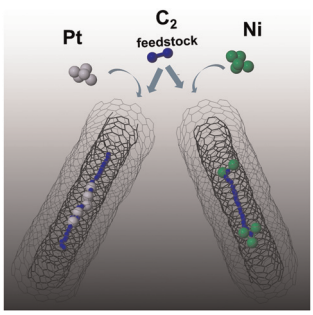
Driving catalytic carbyne formation within endohedral DWCNTs: the role of Ni *vs.* Pt

Kamoliddin Mehmonov, Aziza Ergasheva, S. Mehdi Vaez Allaei, Erik C. Neyts and Umedjon Khalilov*



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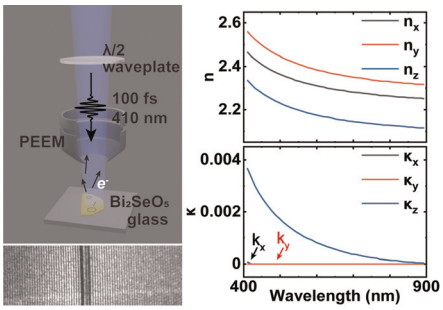

Optical anisotropy of Bi_2SeO_5 and near-field characterization of its waveguide modes

Jinglin Tang, Yaolong Li,* Jingyue Wang,* Yongchao Zhu, Xiaofang Li, Pengzuo Jiang, Jingying Xiao, Yuxin Zhang, Qinyun Liu, Minghao Deng, Guanyu Zhang, Zini Cao, Shufeng Wang, Hong Yang, Xiaoyong Hu,* Han Gao,* Hailin Peng,* Guowei Lyu* and Qihuang Gong

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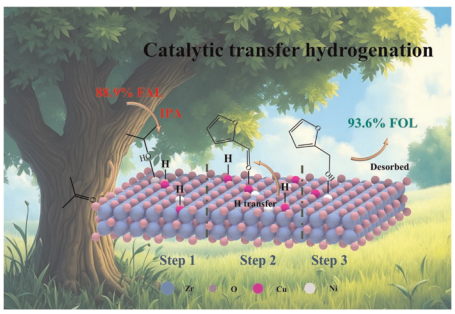
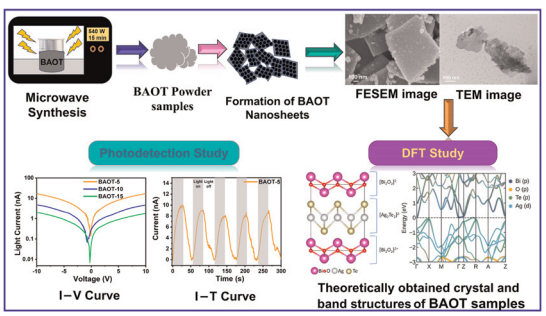


Synergistic effects of bimetallic CuNi–ZrO_2 catalysts in catalytic transfer hydrogenation of furfural

Chenghu Zhang, Zezhou Xing, Ying Li, Tong Xu, Yinghui Sun* and Jie Bai*

18240



BiAgOTe nanosheets with enhanced photoresponse ability: an experimental and computational study

Prabhukrupa Chinmay Kumar, Jnanranjan Panda, Lokanath Patra, Subhashree Mohanty, Sripan Chinnaiyah and Ramakanta Naik*

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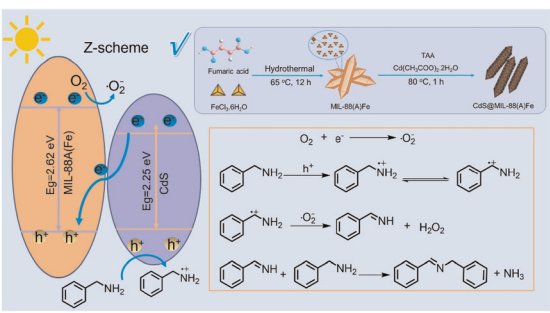

Core–shell-structured Z-scheme CdS@MIL-88(A)Fe heterojunctions for efficient visible light photocatalytic oxidative coupling of benzylamines to imines

Xueqing Xu,* Wenwen Lu, Xuan Sun, Xiaorong Yang, Yezi Zhao, Ziqiang Lei and Zhiwang Yang*

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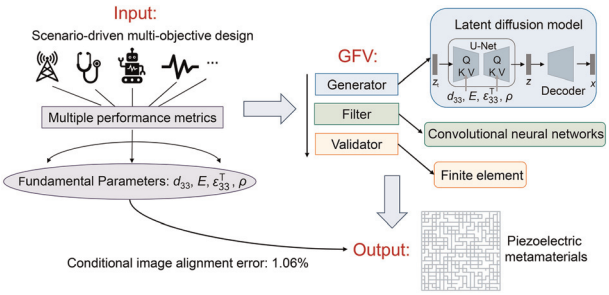
A generative diffusion model enables multi-objective on-demand inverse design of piezoelectric metamaterials

Chun-Yu Lei, Jian Wang, Run-Lin Liu, Meng-Jun Zhou and Zhong-Hui Shen*



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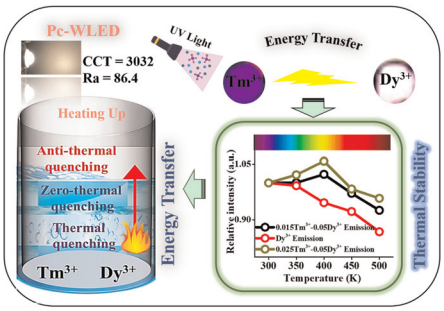
Modulating anti-thermal and concentration quenching for enhanced dysprosium emission

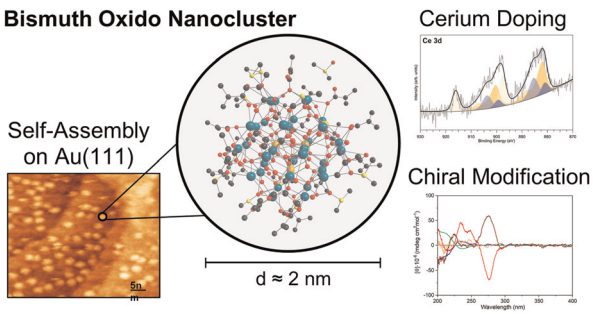
Wasim Ullah Khan, Haris Zaman, Waheed Ullah Khan and Haiou Zhu*



18291

Atomically precise bismuth oxido nanoclusters: cerium doping for optical modification and supramolecular self-assembly on Au(111)

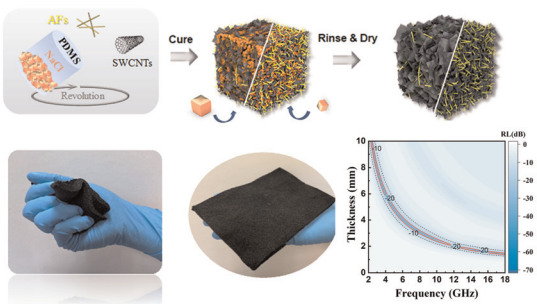
Rico Thomas, Thi Ngoc Ha Nguyen, Marcus Weber, Tobias Rüffer, Fabian Göhler, Antareekshya Deka, Andreas Pöppl, Thomas Seyller, Christoph Tegenkamp and Michael Mehring*



18305

Super-compressible aramid fiber-reinforced carbon nanotube/polydimethylsiloxane foams with high frequency tunable microwave attenuation and adjustable mechanical properties

Hui Ji, Junru Yao, Jichen Zhao, Yijing Zhao, Sreekanth Ginnaram, Jiaqi Tao, Khoo Boo Cheong and Yong Yang*



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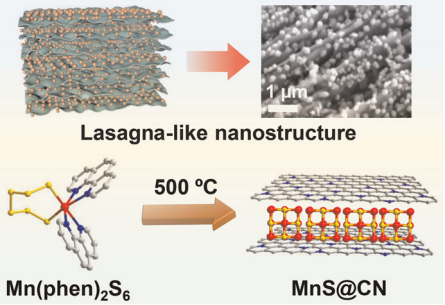
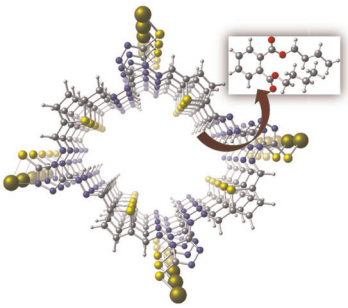


Preparing an MnS@CN composite with lasagna-like nanostructure through pyrolysis of an organic hybrid manganese sulfide for electrochemical lithium storage

Yanqi Wang, Longfei Zhai* and Wei-Wei Xiong*

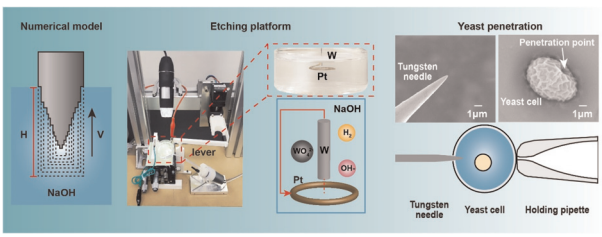
18325



Nanohoop anchored plasmonic surfaces for polarity-dependent ultrasensitive sensing

Ashish Kumar Dhillon, Rabindranath Lo, Sanmitra Barman,* Kolleboyina Jayaramulu* and Soumik Siddhanta*

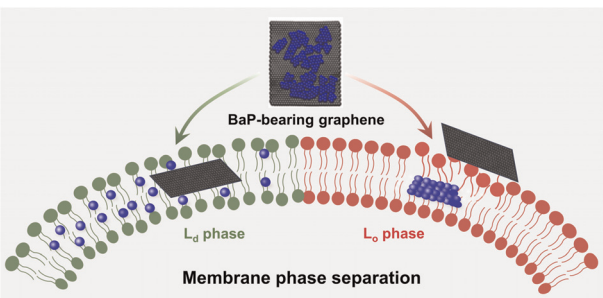
18336



Numerically controlled electrochemical etching of tungsten nano-needles for penetrating the tough yeast cell wall

Zuokun Yin, Wenhong Zhang, Wende He, Weiguang Su, Jing Wang, Jun Chen* and Li Wang*

18345



Phase separation-driven modulation of cell membrane interactions with benzo[*a*]pyrene-bearing graphene nanosheets: molecular insights into combined toxicity

Hongxia Ma, Xiaoyang Zhang, Jing Liu, Jie Chen and Tongtao Yue*

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PAPERS

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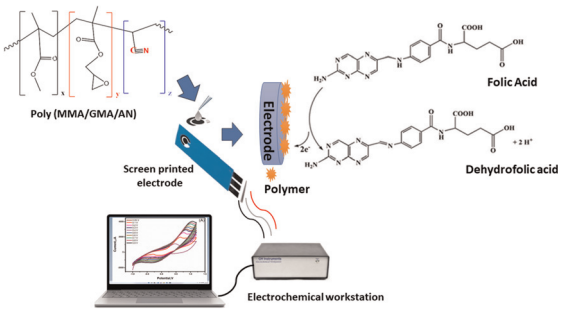
Innovative formulation of a functional nano-copolymer derived from glycidyl methacrylate and acrylonitrile as an exceptionally sensitive and selective electrochemical sensor for folic acid detection in pharmaceutical and food samples

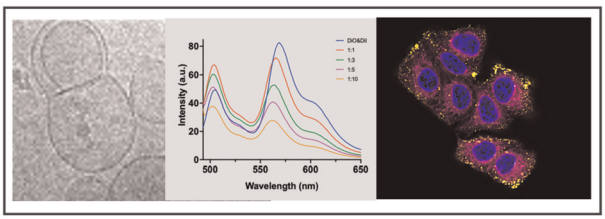
Rokaya A. Sobh* and Hend S. Magar*



18377

Fusion of liposomes incorporating α-linolenic acid with the cell plasma membrane is site-restricted

Abdullah Aljasser, Ramy Elbahr, Cynthia Bosquillon and Snow Stolnik*



CORRECTION

18392

Correction: Membrane-localized magnetic hyperthermia promotes intracellular delivery of cell-impermeant probes

Javier Idiago-López, Daniela Ferreira, Laura Asín, María Moros, Ilaria Armenia, Valeria Grazú, Alexandra R. Fernandes, Jesús M. de la Fuente, Pedro V. Baptista* and Raluca M. Fratila*