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# Nanoscale

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## IN THIS ISSUE

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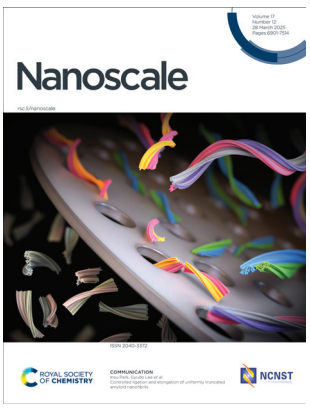


**Cover**
See Insu Park, Gyudo Lee *et al.*, pp. 6993–7001.

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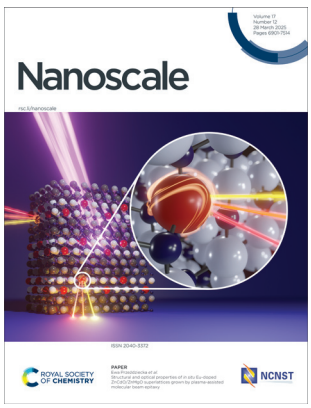


**Inside cover**
See Ewa Przeździecka *et al.*, pp. 7055–7065.

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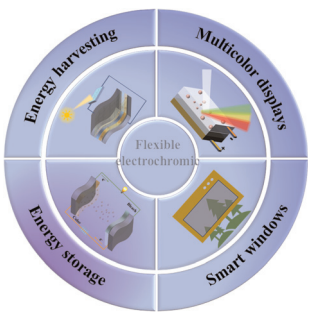
## REVIEWS

6919

**Recent advances in flexible multifunctional electrochromic devices**

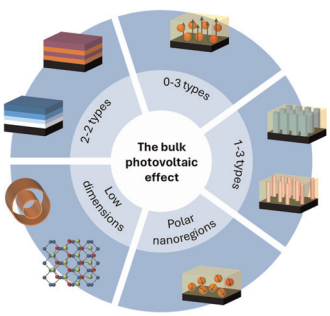
Jiamin Yu, Shanjie Wang, Lin Gao, Guoqi Qiao, Meng-Fang Lin, Cong Wei, Jingwei Chen* and Shaohui Li*




6938

**Nanostructure engineering for ferroelectric photovoltaics**

Wenzhong Ji, Teng Lu* and Yun Liu*



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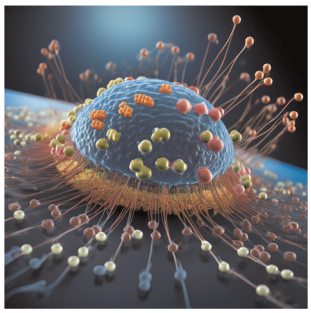
## REVIEWS

6960

**Understanding the interplay between pH and charges for theranostic nanomaterials**

Valerie Ow, Qianyu Lin, Joey Hui Min Wong, Belynn Sim, Yee Lin Tan, Yihao Leow, Rubayn Goh* and Xian Jun Loh*

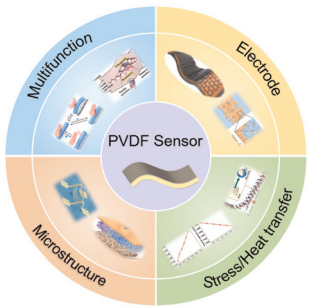


## MINIREVIEW

6981

**External strategies for enhanced sensing performance of self-powered polyvinylidene fluoride-based sensors**

Fang Wang,* Zixuan Song, Xinchen Cai, Kai Guo, Xiaoyu Pan,* Chuanlai Ren and Bo Li*

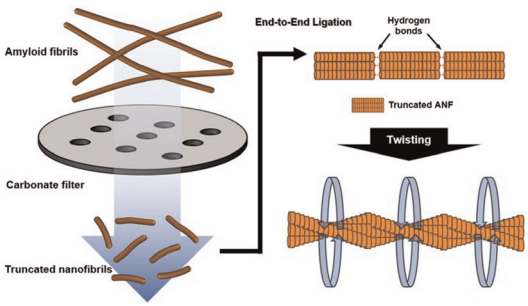



## COMMUNICATIONS

6993

**Controlled ligation and elongation of uniformly truncated amyloid nanofibrils**

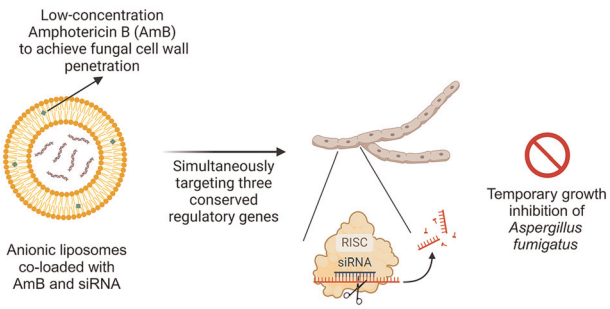
Seokbeom Roh, Da Yeon Cheong, Sangwoo Lee, Jongsang Son, Insu Park* and Gyudo Lee*




7002

**Enhanced antifungal activity of siRNA-loaded anionic liposomes against the human pathogenic fungus *Aspergillus fumigatus***

Yidong Yu, Theresa Vogel, Sina Hirsch, Jürgen Groll, Krystyna Albrecht* and Andreas Beilhack*



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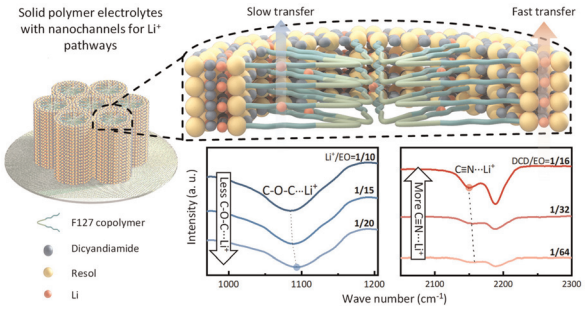
## COMMUNICATIONS

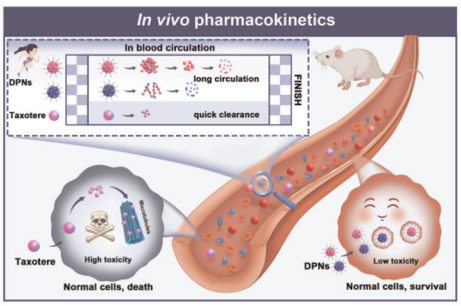
7008




**One-pot synthesis of long-range aligned nanochannels for Li-ion transfer pathways**

Zehan Chen, Isaac Alvarez Moises, Ruth Bruker, He Jia, Shanshan Yan, Yinghui Zhang, Zhenni He, Kejie Zhou, Sorin Melinte, Laurent Rubatat, Klaus Meerholz and Jean-François Gohy*

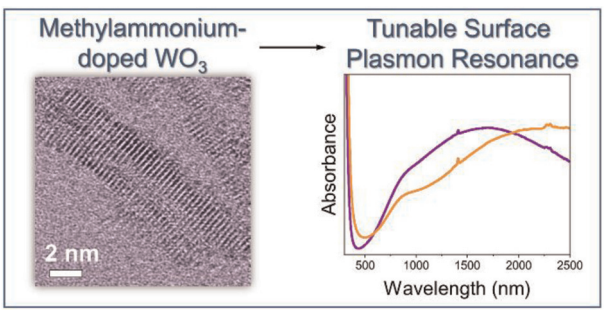
7016




**An assembly modules deformation strategy improved the chemical stability and self-assembly stability of docetaxel prodrugs nanoassemblies**

Wenjing Wang, Shuo Wang, Shengyao Xu, Rong Chai, Jun Yuan, Hao Zhang, Yaqi Li, Xiaohui Pu, Xin Li, Jin Sun, Zhonggui He* and Bingjun Sun*

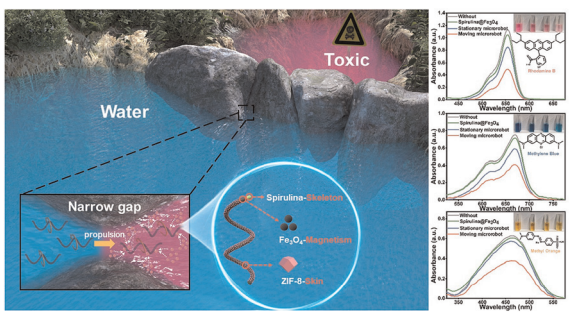
7030




**Tungsten oxide nanocrystals doped with interstitial methylammonium cations**

Owen Kendall, Lesly V. Melendez, Merve Nur Guven Bicer, Michael Wilms, Joel van Embden, Daniel E. Gómez, Arrigo Calzolari, Deborah Prezzi* and Enrico Della Gaspera*

7035




**Biohybrid microrobots with a Spirulina skeleton and MOF skin for efficient organic pollutant adsorption**

Yongcheng Li, Dajian Li, Yuhong Zheng, Sirui Lu, Yuepeng Cai* and Renfeng Dong*



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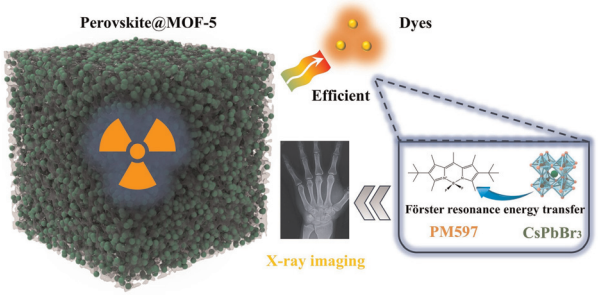
## COMMUNICATIONS

7045

**One stone, two birds: robust and self-absorption free flexible perovskite scintillators by metal–organic framework encapsulation**

Jie Zhou, Zhouyuanhang Wang, Zhongren Shi, Xilin Zhang, Lan Yang, Yuxuan Jiang, Yan Kuai, Zhijia Hu* and Siqi Li*




## PAPERS

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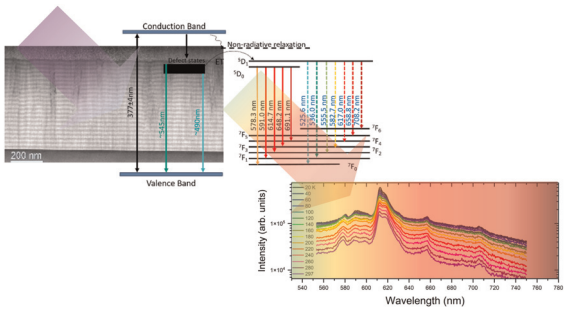
**Structural and optical properties of *in situ* Eu-doped ZnCdO/ZnMgO superlattices grown by plasma-assisted molecular beam epitaxy**

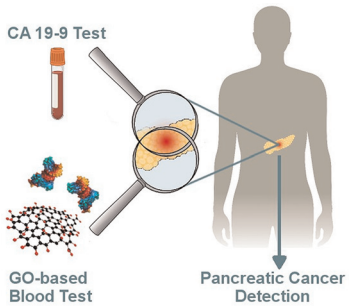
Anastasiia Lysak, Aleksandra Wierzbicka, Sergio Magalhaes, Piotr Dłużewski, Rafał Jakieła, Michał Szot, Zeinab Khosravizadeh, Abinash Adhikari, Adrian Kozanecki and Ewa Przeździecka*




7066

**Nanoparticle-protein corona enhances accuracy of Ca-19.9-based pancreatic cancer classification**

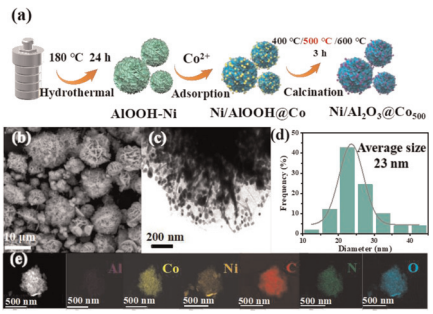
Luca Digiacomo, Damiano Caputo, Roberto Cammarata, Vincenzo La Vaccara, Roberto Coppola, Erica Quagliarini, Manuela Iacobini, Serena Renzi, Francesca Giulimondi, Daniela Pozzi,* Giulio Caracciolo* and Heinz Amenitsch




7076

**Densely distributed Co onto carbon-layer-coated flower-like $Ni/Al_2O_3$ and its tailored integration into a stirrer for multiple catalytic degradation and solar-powered water evaporation**

Shuang Jiang, Hongyao Zhao, Zichen Ma, Hongyang Zhu, Danhong Shang, Linzhi Zhai, Yanyun Wang,* Yiyan Song* and Fu Yang*



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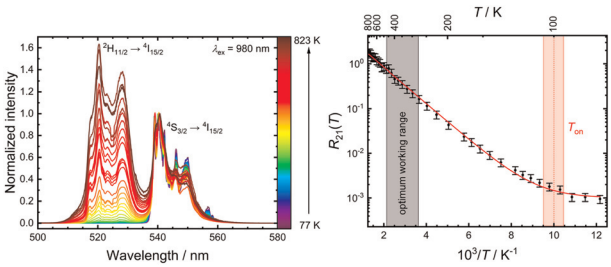
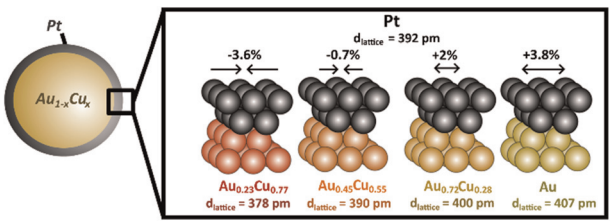
7091




**What makes β-$NaYF_4$:$Er^{3+}$,$Yb^{3+}$ such a successful luminescent thermometer?**

Markus Suta

7100




**Synthetic control over lattice strain in trimetallic AuCu-core Pt-shell nanoparticles**

Just P. Jonasse, Marta Perxés Perich, Savannah J. Turner and Jessi E. S. van der Hoeven*

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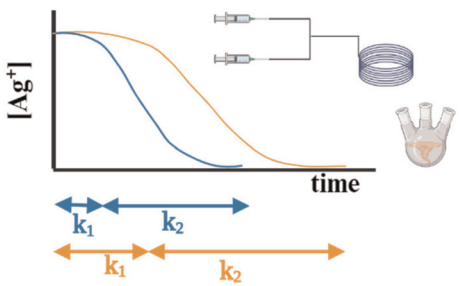


**Kinetic analysis of silver nanowire synthesis: polyol batch and continuous millifluidic methods**

Destiny F. Williams, James E. Smay and Shohreh Hemmati*

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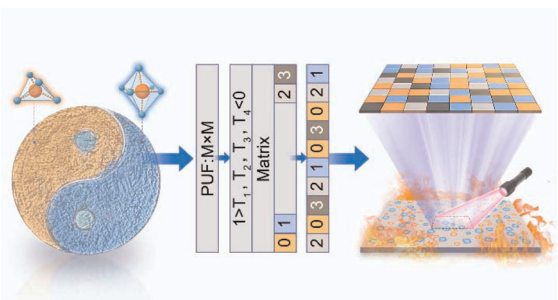


**Multilevel, solar-blind, and thermostable physical unclonable functions based on host-sensitized luminescence of β-$Ga_2O_3$:$Dy^{3+}$**

Dong Zhu, Chunfeng Wang,* Fuhang Jiao, Jiujun Xu, Haoran Xu, Shun Han, Peijiang Cao, Yuxiang Zeng, Ming Fang, Wenjun Liu, Deliang Zhu* and Youming Lu*



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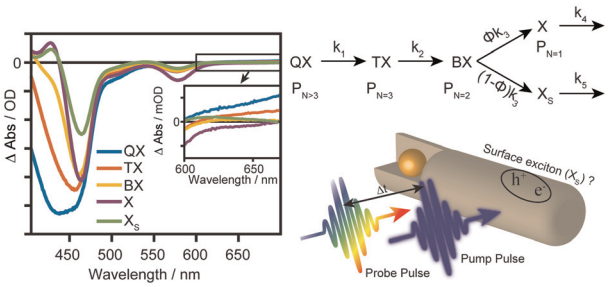
## PAPERS

7141

**Spectral and dynamical properties of multiexcitons in semiconductor nanorods**

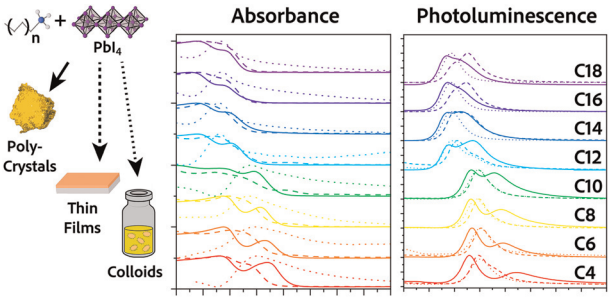
Krishan Kumar* and Maria Wächtler*




7153

**Studying the effect of dimensions and spacer ligands on the optical properties of 2D lead iodide perovskites**

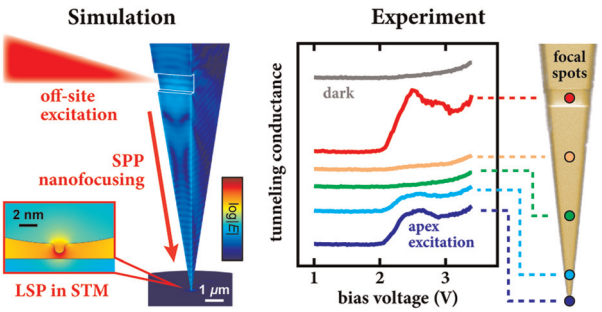
Orly Abarbanel, Rawan Hirzalla, Leehie Aridor, Elisheva Michman and Ido Hadar*




7164

**Quantitative comparison of local field enhancement from tip-apex and plasmonic nanofocusing excitation *via* plasmon-assisted field emission resonances**

Chenfang Lin,* Jie Li, Guoao Li, Wenjie Luo, Shuyi Liu, Adnan Hammud, Yang Xia, Anlian Pan, Martin Wolf, Melanie Müller and Takashi Kumagai*

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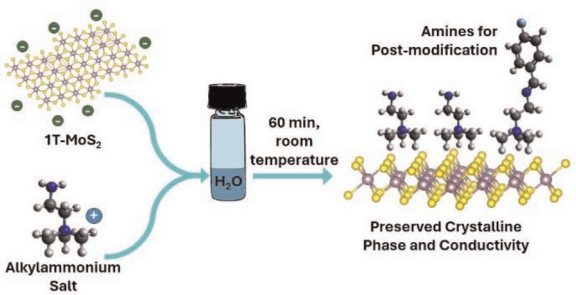
**Supramolecular electrostatic functionalization of 1T-$MoS_2$ based on alkylammonium salts**

Giuseppe Misia, Michele Cesco, Maurizio Prato* and Alessandro Silvestri*



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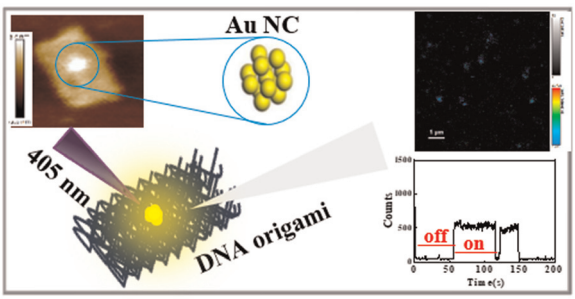
## PAPERS

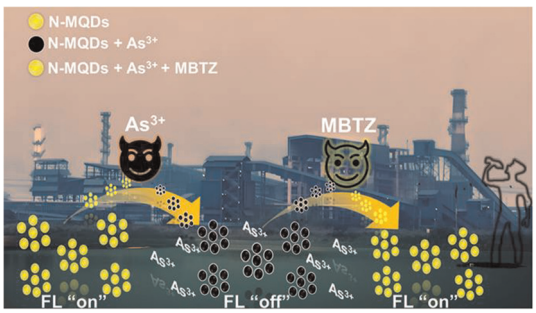
7180




**DNA origami-templated individual gold nanoclusters: probing their photophysical dynamics using single-molecule fluorescence spectroscopy**

Shikha Rai, Vishaldeep Kaur, Charanleen Kaur, Mridu Sharma and Tapasi Sen*

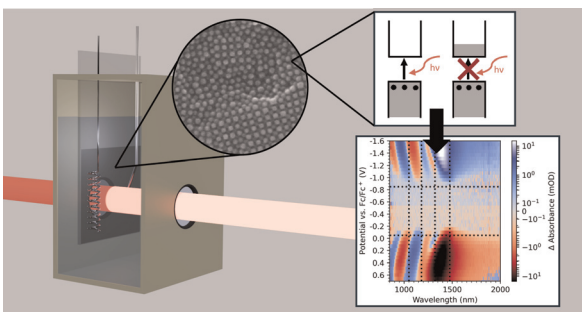
7193




**Bright yellow fluorescent N-doped $Ti_3C_2$ MXene quantum dots as an "on/off/on" nanoprobe for selective $As^{3+}$ ion detection**

Santanu Bera and Susanta Kumar Bhunia*

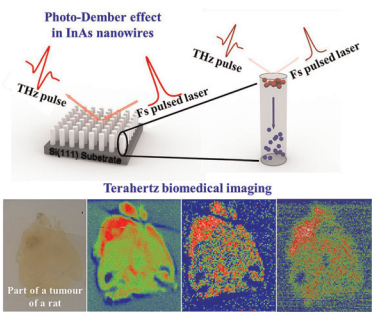
7202




**Spectroelectrochemistry with hydrogen-doped indium oxide electrodes monitors electron and hole injection into PbS quantum dots**

Sophia Westendorf, Shangjing Li, Patrick Michel, Bin Hu* and Marcus Scheele*

7211




**Terahertz biomedical imaging using a terahertz emitter based on InAs nanowires**

Dong Woo Park, Young Bin Ji, Ilgyu Choi, Jeongwoo Hwang, Jae Cheol Shin, Jin Chul Cho, Eui Su Lee, Seung Jae Oh,* Siyun Noh, Jaehyeok Shin and Jin Soo Kim*



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## PAPERS

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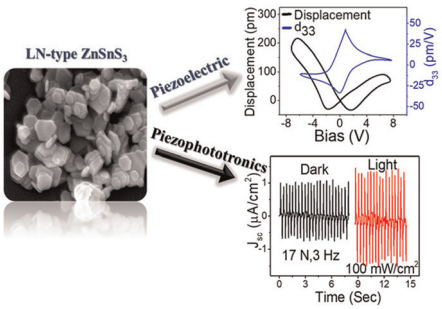
**Exploring piezoelectric and piezophototronic properties of nanostructured LN-$ZnSnS_3$ for photoresponsive vibrational energy harvesting**

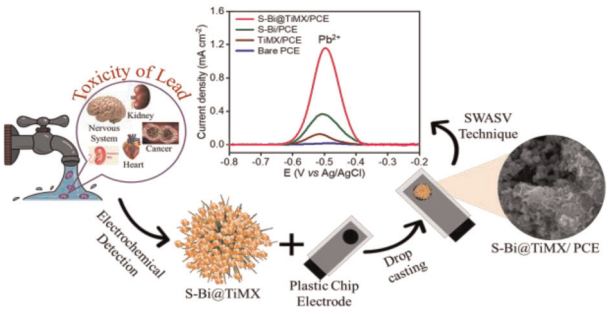
Surajit Das, Swadesh Paul and Anuja Datta*




7229

**A modified MXene composite sensor with sulphur impurities for electrochemical detection of lead in the aqueous system**

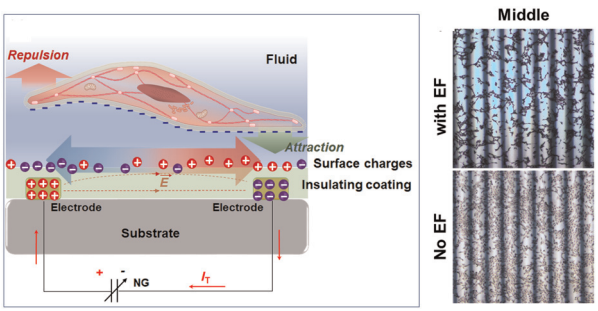
Km Sapna, Vartika Sharma, Manoj Kumar* and Vaibhav Kulshrestha*




7244

**Inhibitory effects on smooth muscle cell adhesion and proliferation due to oscillating electric fields by nanogenerators**

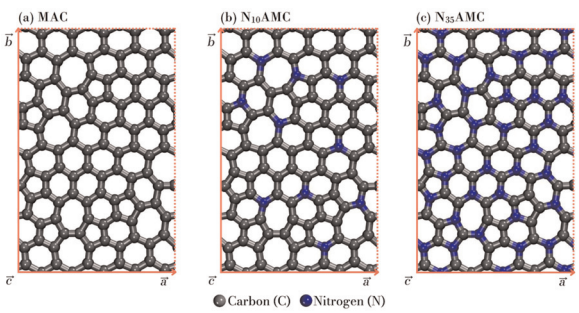
Zulmari Silva Pedraza, Fengdan Pan, Pengfei Chen, Steven Melendez Rosario, Grace Wu, Derui Wang, Jooyong Kim, Qianfan Yang, Bo Liu* and Xudong Wang*




7253

**Exploring the electronic and mechanical properties of the recently synthesized nitrogen-doped amorphous monolayer carbon**

Emanuel J. A. dos Santos, Marcelo L. Pereira, Junior,* Raphael M. Tromer, Douglas S. Galvão and Luiz A. Ribeiro, Junior



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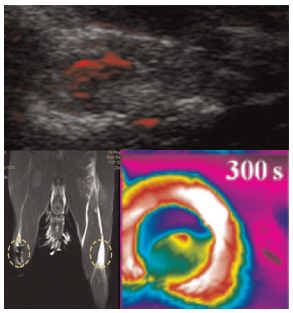
## PAPERS

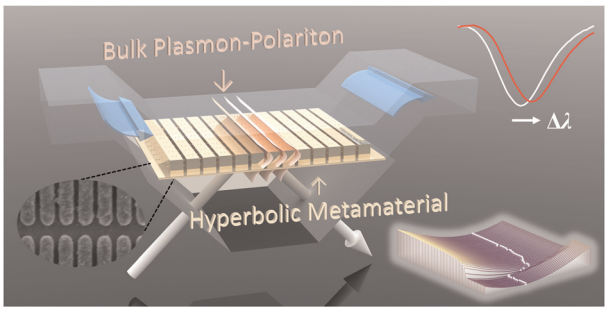
7264




**Magnetic nanoparticle-mediated non-invasive imaging and eradication of lymph nodes**

Wei Gao, Xiaojun Cai, Yan Wang, Dechao Niu* and Yuanyi Zheng*

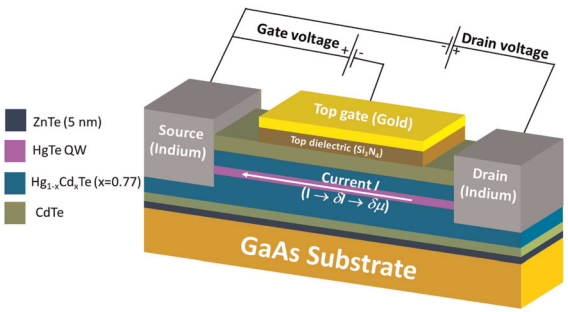
7271




**Composite metamaterial of hyperbolic nanoridges and gold nanoparticles for biosensing**

Xinzhao Yue, Tao Wang,* Yaohua Cai, Huimin Wang, Enze Lv, Xuyang Yuan, Jinwei Zeng, Wenyu Zhao* and Jian Wang*

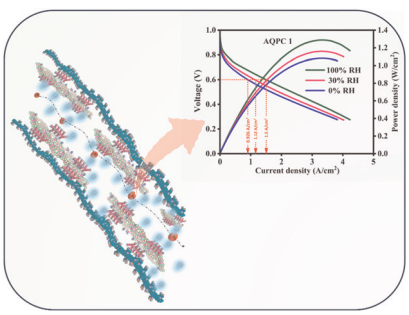
7281




**Temperature and electron concentration dependences of 1/*f* noise in $Hg_{1-x}Cd_xTe$ – evidence for a mobility fluctuations mechanism**

Adil Rehman,* Volodymyr Petriakov, Ivan Yahniuk, Aleksandr Kazakov, Iwona Rogalska, Jakub Grendysa, Michał Marchewka, Maciej Haras, Tomasz Wojtowicz, Grzegorz Cywiński,* Wojciech Knap and Sergey Rumyantsev*

7289




**Radical initiated polymerization of *p*-styrenesulfonate on graphitic carbon nitride for interconnected water networks in short-side-chain PFSA membranes for low-humidity hydrogen fuel cells**

Maniprakundil Neeshma, Punnappadam Rajan Suraj, Baskaran Mohan Dass and Santoshkumar D. Bhat*



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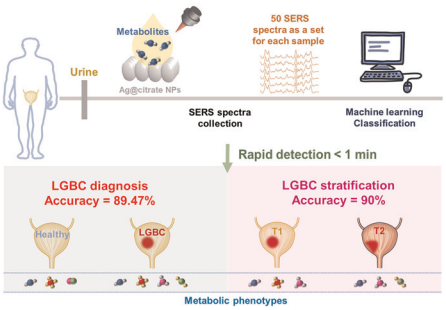
## PAPERS

7303

**Non-invasive and rapid diagnosis of low-grade bladder cancer *via* SERSomes of urine**

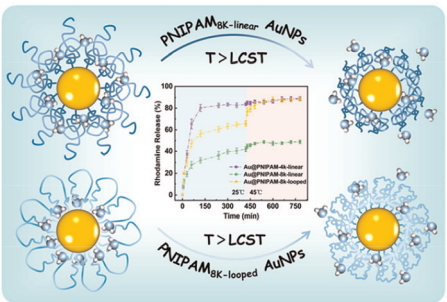
Yao Lu, Jiayi Wang, Xinyuan Bi, Hongyang Qian, Jiahua Pan* and Jian Ye*




7313

**Improving colloidal stability and response performances using looped thermal-responsive brushes**

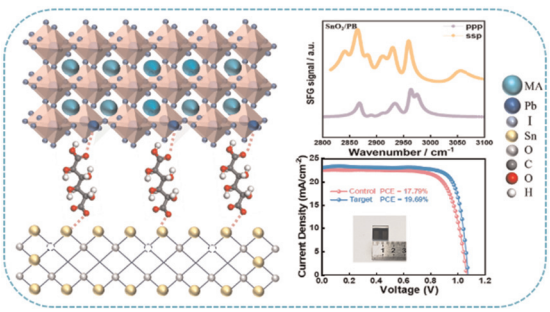
Chi Li, Jin Jing, Yanxiong Pan,* Xiangling Ji and Wei Jiang*




7324

**Interface-oriented bridges toward efficient carbon-based perovskite solar cells**

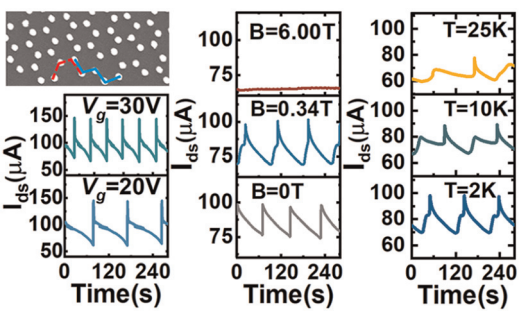
Yan Chen, Zhensang Tong, Feifei Ding, Huanyi Zhou, Ye Yang, JinYan Huang, Jianwu Wei, Qionghua Su, Zhihui Liu, HanChi Cheng,* Liya Zhou* and Peican Chen*




7335

**Constant voltage driving current oscillation in artificial graphene ribbons with deterministic chiral edges**

Yan Zhan, Qiang Huang, Jingpu Yang, Wei Luo, Zuimin Jiang and Zhenyang Zhong*



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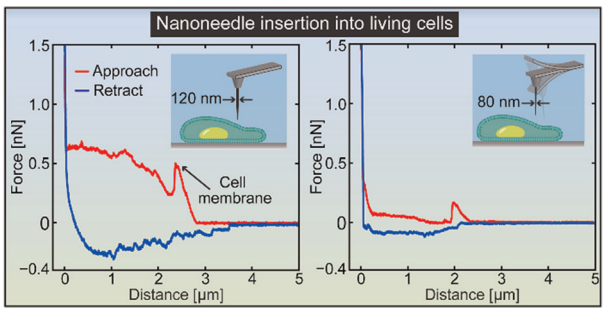
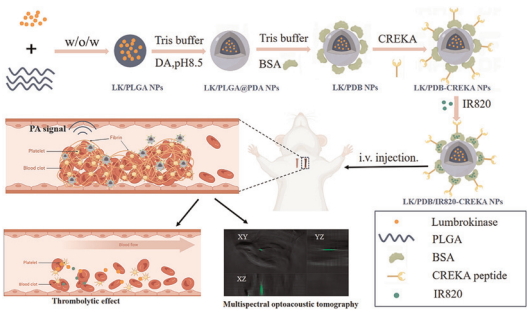
7342




**Significant reduction of cell invasiveness in nanoneedle insertion into a living cell with an electron-beam-deposited probe: impacts of probe geometry, speed and vibration**

Mohammad Shahidul Alam, Marcos Penedo,* Takehiko Ichikawa, Mohammad Mubarak Hosain, Kyosuke Matsumoto, Keisuke Miyazawa and Takeshi Fukuma*

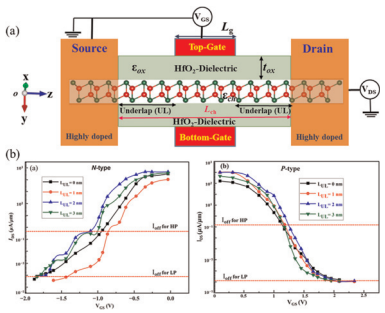
7351




**Construction of fibrin-targeted nanoparticles for imaging diagnosis and treatment of arterial thrombosis**

Yaxue Liu, Yu Li, Junlong Chen, Pei Xie and Zongning Yin*

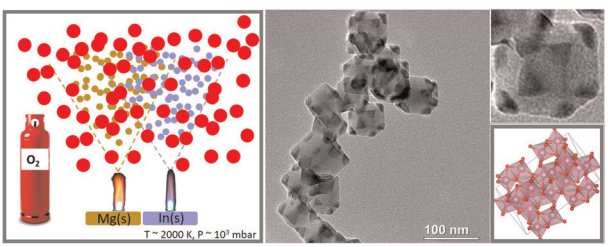
7367




**Quantum transport simulations of monolayer β-AgI: a prospective nanochannel material in sub-1 nm gate-length MOSFETs**

Mudasser Husain,* Nasir Rahman and Jing Lu*

7379




**Low-dimensional $In_2O_3$ nanostructures on MgO cubes**

Jacek Goniakowski,* Cédric Baumier, Franck Fortuna and Slavica Stankic*



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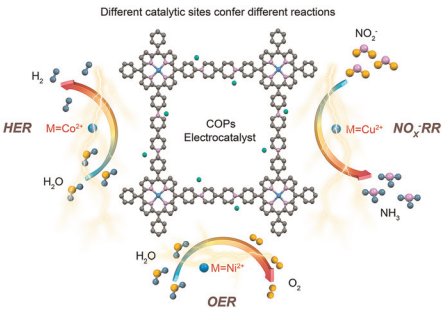
## PAPERS

7385

**Construction of hydrophilic-and-cationic metalloporphyrin-based polymers for electrocatalytic small molecule activation**

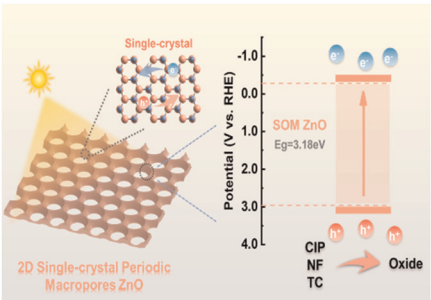
Dengmeng Song, Chunyu Zhou, Yujia Wang, Li Xia, Dan Xue, Jun Li and Ning Wang*




7391

**Two-dimensional single-crystal periodic macroporous ZnO sheets for extraordinary photocatalytic performance for antibiotics**

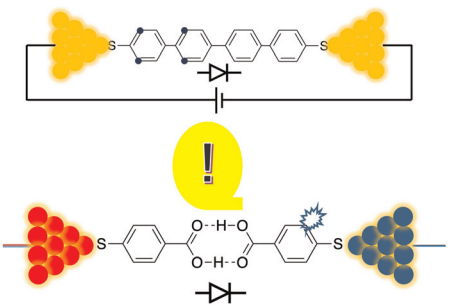
Ling Zhou, Yongjun Fu, Manxing Mo, Yihan Tong, Ping Niu, Junchao Wei, Rongbin Zhang, Ruihong Deng* and Xuewen Wang*




7402

**Anharmonicity-induced thermal rectification of a single diblock molecular junction inspired by the Aviram–Ratner diode**

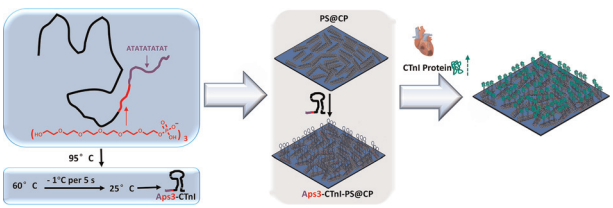
Hisao Nakamura* and Naoyuki Karasawa



7412

**Novel paper sensor with modified aptamer for accurate detection of clinical cardiac troponin I**

Qing Xie, Danfeng Wu, Qinran Chen, Haiyan Liang,* Leyu Wang* and Xiaozhong Qiu*



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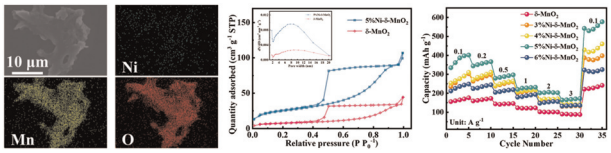
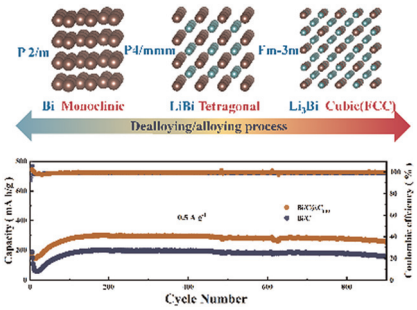
7423




**Nickel-doped δ-$MnO_2$ abundant in oxygen vacancies as a cathode material for aqueous Zn-ion batteries with superior performance**

Shaolin Yang,* Fangfang Li, Panpan Fu, Cheng Zhen, Jiandong Wu, Hui Lu, Chunping Hou and Zhilin Sheng

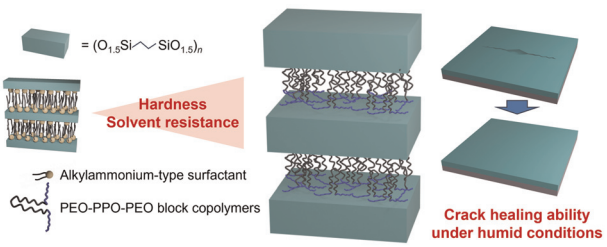
7434




**Microstructure modulation improving the stability performance of a Bi anode for lithium-ion batteries**

Yi-wen Chen, Cheng-Lu Yang, Jun Guo,* Bu-Ming Chen,* Hui Huang and Rui-dong Xu

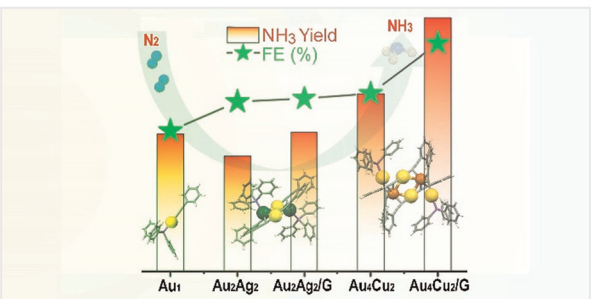
7445




**Tuning structures and properties of self-healing silsesquioxane films using block copolymers**

Yoshiaki Miyamoto, Takamichi Matsuno and Atsushi Shimojima*

7453




**Electrocatalytic nitrogen reduction to ammonia by graphene-supported $Au_4Cu_2$ and $Au_2Ag_2$ nanoclusters**

Aamir Shehzad, Qiuhao Yi, Chaonan Cui and Zhixun Luo*



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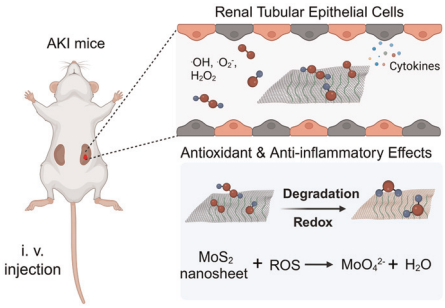
7460

**Engineered molybdenum disulfide nanosheets as scavengers against oxidative stress inhibit ferroptosis to alleviate acute kidney injury**

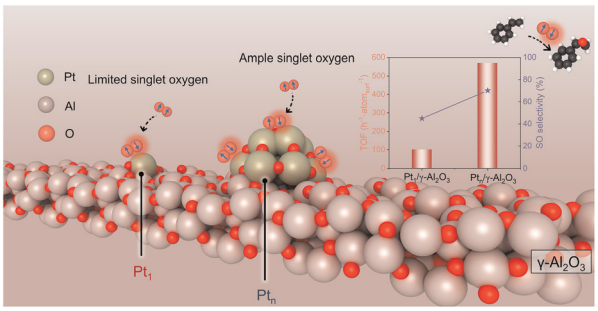
Xuwu Zhang, Zhipeng Xu, Yongzheng Zhang, Dan Wei, Shuping Zhang, Jianning Wang* and Jiayu Ren*




7474

**Proper aggregation of Pt is beneficial for the epoxidation of styrene by $O_2$ over $Pt_x/\gamma\text{-}Al_2O_3$ catalysts**

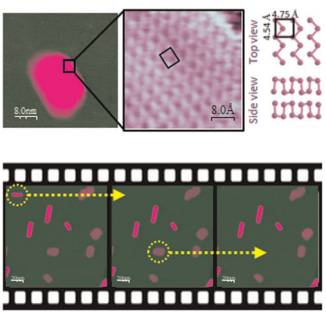
Fengfeng Li, Chenyang Shen, Yu He, Haoyu Lu, Rongtian Gu, Jun Yao, Zhewei Zhang, Feifei Mei, Taotao Zhao, Xiangke Guo, Nianhua Xue and Weiping Ding*




7482

**Growing and nanomanipulating heterostructures of α-bismuthene in a nearly isolated state**

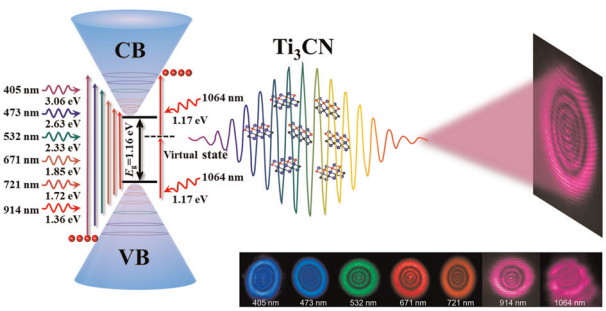
Antonio J. Martínez-Galera* and José M. Gómez-Rodríguez




7488

**Efficient spatial self-phase modulation in the near-infrared and visible regimes of transition metal carbonitride $Ti_3CN$**

Jiawei Cao, Xiaodan Xu, Yixuan Huang, Tengdong Zhang, Ying Liu, Haotian Yang, Jimin Zhao,* Jun Li* and Yanling Wu*



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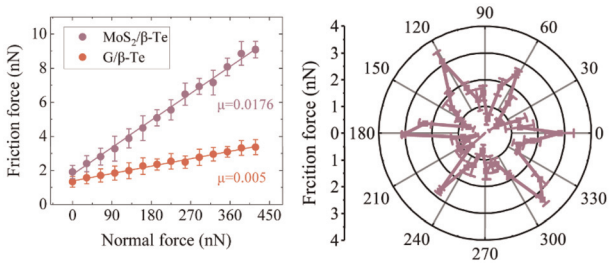
7497




**Interfacial polarization-induced tribological behavior in $MoS_2$/β-Te and G/β-Te heterostructures**

Guoliang Ru, Weihong Qi,* Kaiyuan Xue, Mengzhao Wang and Xuqing Liu

## CORRECTION

7511

**Correction: Simulation of the resistance switching performance and synaptic behavior of $TiO_2$-based RRAM devices with $CoFe_2O_4$ insertion layers**

Fei Yang,* Bo Hu, Zijian He, Bingkun Liu, Shilong Lou, Duogui Li and Wentao Wang



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