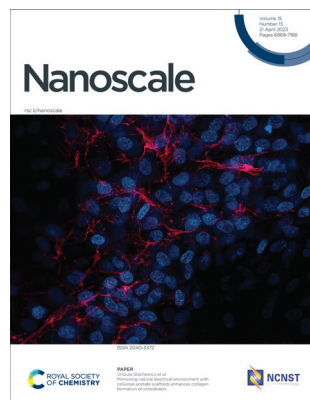


IN THIS ISSUE

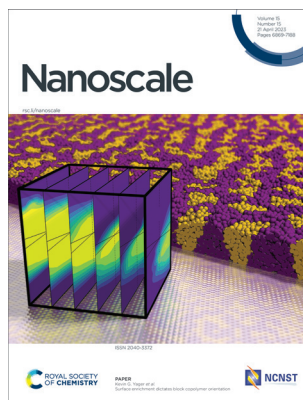
ISSN 2040-3372 CODEN NANOHL 15(15) 6869–7188 (2023)



Cover

See Urszula Stachewicz *et al.*, pp. 6890–6900.

Image reproduced by permission of Urszula Stachewicz from *Nanoscale*, 2023, **15**, 6890.



Inside cover

See Kevin G. Yager *et al.*, pp. 6901–6912.

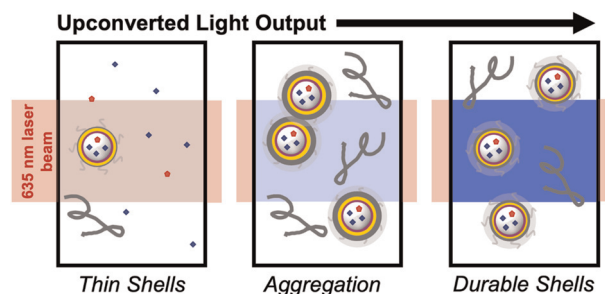
Image reproduced by permission of Kevin G. Yager from *Nanoscale*, 2023, **15**, 6901.

COMMUNICATION

6880

Controlling the durability and optical properties of triplet–triplet annihilation upconversion nanocapsules

Tracy H. Schloemer, Samuel N. Sanders, Pournima Narayanan, Qi Zhou, Manchen Hu and Daniel N. Congreve*

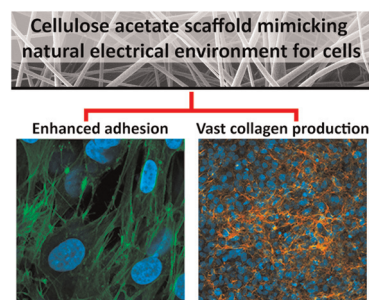


PAPERS

6890

Mimicking natural electrical environment with cellulose acetate scaffolds enhances collagen formation of osteoblasts

Piotr K. Szewczyk, Krzysztof Berniak, Joanna Knapczyk-Korczak, Joanna E. Karbowiczek, Mateusz M. Marzec, Andrzej Bernasik and Urszula Stachewicz*



Editorial Staff

Executive Editor

Michaela Mühlberg

Managing Editor

Heather Montgomery

Editorial Production Manager

Jonathon Watson

Senior Publishing Editor

Daniella Ferlucio

Development Editor

Edward Gardner

Publishing Editors

Blake Baker, Matthew Blow, Chris Dias, Hemna Fathima, Juan Gonzalez, Eleanor Griffiths, Rob Hinde, Ash Hyde, Sam Howell, Francesca Jacklin, Shruti Karnik, Sophie Koh, Tamara Kosikova, Evie Karkera, Brian Li, Sam Mansell, Carole Martin, Kirsty McRoberts, Cat Schofield, Charu Storr-Vijay, Manman Wang, Tom Williams, Ella White

Editorial Assistant

Elizabeth So

Publishing Assistant

Lee Colwill

Assistant Editor

Jie Gao, Yu Zhang

Publisher

Sam Keltie

For queries about submitted papers, please contact Jonathon Watson, Editorial Production Manager in the first instance.

E-mail: nanoscale@rsc.org

For pre-submission queries please contact Michaela Mühlberg, Executive Editor. E-mail: nanoscale-rsc@rsc.org
Nanoscale (electronic: ISSN 2040-3372) is published 48 times a year by the Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, UK CB4 0WF.

All orders, with cheques made payable to the Royal Society of Chemistry, should be sent to the Royal Society of Chemistry Order Department, Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK

Tel +44 (0)1223 432398; E-mail orders@rsc.org

2023 Annual (electronic) subscription price: £1936/\$3155.

Customers in Canada will be subject to a surcharge to cover GST. Customers in the EU subscribing to the electronic version only will be charged VAT.

If you take an institutional subscription to any Royal Society of Chemistry journal you are entitled to free, site-wide web access to that journal. You can arrange access via Internet Protocol (IP) address at www.rsc.org/ip
Customers should make payments by cheque in sterling payable on a UK clearing bank or in US dollars payable on a US clearing bank.

Whilst this material has been produced with all due care, the Royal Society of Chemistry cannot be held responsible or liable for its accuracy and completeness, nor for any consequences arising from any errors or the use of the information contained in this publication. The publication of advertisements does not constitute any endorsement by the Royal Society of Chemistry or Authors of any products advertised. The views and opinions advanced by contributors do not necessarily reflect those of the Royal Society of Chemistry which shall not be liable for any resulting loss or damage arising as a result of reliance upon this material. The Royal Society of Chemistry is a charity, registered in England and Wales, Number 207890, and a company incorporated in England by Royal Charter (Registered No. RC000524), registered office: Burlington House, Piccadilly, London W1J 0BA, UK, Telephone: +44 (0) 207 4378 6556.

Advertisement sales:

Tel +44 (0) 1223 432246; Fax +44 (0) 1223 426017;

E-mail advertising@rsc.org

For marketing opportunities relating to this journal, contact marketing@rsc.org

Nanoscale

rsc.li/nanoscale

Nanoscale publishes experimental and theoretical work across the breadth of nanoscience and nanotechnology.



Published in collaboration with the National Centre for Nanoscience and Technology, Beijing, China

Editorial Board

Editors-in-Chief

Chunli Bai, National Centre for Nanoscience and Nanotechnology, China
Dirk Guld, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

Associate Editors

Cinzia Casiraghi, University of Manchester, UK
Gianurelio Cuniberti, TU Dresden (Technische Universität Dresden), Germany
Qing Dai, National Center for Nanoscience and Technology of China, China
Yves Dufrène, Université Catholique de Louvain, Belgium

Andrea Ferrari, University of Cambridge, UK
Dong Ha Kim, Ewha Womens University, South Korea
Christian Klink, University of Rostock, Germany
Quan Li, The Chinese University of Hong Kong, Hong Kong
Zhiqun Lin, National University of Singapore, Singapore
Xing Yi Ling, Nanyang Technological University, Singapore
Xiaogang Liu, National University of Singapore, Singapore
Renzhi Ma, National Institute for Materials

Science, Japan
Janet Macdonald, Vanderbilt University, USA
Teresa Pellegrino, Istituto Italiano di Tecnologia, Italy
Dong Qin, Georgia Institute of Technology, USA
Elena Shevchenko, Argonne National Laboratory, USA
Jonathan Veinot, University of Alberta, Canada
Umesh Waghmare, Jawaharlal Nehru Centre for Advanced Scientific Research, India
Manzhou Zhu, Anhui University, China
Jin Zou, The University of Queensland, Australia

Advisory Board

Zhenan Bao, Stanford University, USA
Amanda Barnard, Australian National University, Australia
Suryasarathi Bose, Indian Institute of Science Bangalore, India
Stephanie Brock, Wayne State University, USA
Raffaella Buonsanti, EPFL, Switzerland
Chunying Chen, National Center for Nanoscience and Technology of China, China
Jingyi Chen, University of Arkansas, USA
Wenlong Chen, Monash University, Australia
Xiaodong Chen, Nanyang Technological University, Singapore
Serena Cussen, University of Sheffield, UK
Kristen Fichthorn, Penn State University, USA
Christy Haynes, University of Minnesota, USA
Guohua Jia, Curtin University, Australia
Xingyu Jiang, Southern University of Science and Technology, China
Rongchao Jin, Carnegie Mellon University, USA
Song Jin, University of Wisconsin, USA
Jesse Jokerst, University of California San Diego, USA
Kourosh Kalantar-zadeh, The University of Sydney, Australia
Yamuna Krishnan, University of Chicago, USA
Katharina Landfester, Max Planck Institute for Polymer Research, Germany
Pooi See Lee, Nanyang Technological University, Singapore
Graham Leggett, The University of Sheffield, UK
Changming Li, Southwest University, China

Jie Liu, Duke University, USA
Laura Na Liu, Max Planck Institute for Intelligent Systems, Germany
Yunqi Liu, Institute of Chemistry, Chinese Academy of Sciences, China
Wei Lu, University of Michigan, USA
Liberato Manna, Istituto Italiano di Tecnologia, Italy
Anna Fontcuberta i Morral, EPFL, Switzerland
Catherine Murphy, University of Illinois at Urbana-Champaign, USA
Kostya (Ken) Ostrikov, Queensland University of Technology, Australia
So-Jung Park, Ewha Womens University, Korea
T Pradeep, Indian Institute of Technology Madras, India
Lakshmi Polavarapu, University of Vigo, Spain
Narayan Pradhan, Indian Association for the Cultivation of Science, India
Paolo Samori, Université de Strasbourg, France
Michael Sailor, University of California, San Diego, USA
Zhigang Shuai, Tsinghua University, China
Sara Skrabalak, Indiana University, USA
Francesco Stellacci, EPFL, Switzerland
Hong-Bo Sun, Jilin University, China
Ling-Dong Sun, Peking University, China
Shouheng Sun, Brown University, USA
Xiaoming Sun, Beijing University of Chemical Technology, China
Dmitri Talapin, University of Chicago, USA
Zhiyong Tang, National Center for NanoScience and Technology, China

Mauricio Terrones, The Pennsylvania State University, USA
Sarah Tolbert, University of California, Los Angeles, USA
Ventsislav Valev, University of Bath, UK
Miriam Vitiello, CNR Nano, Italy
Jianfang Wang, Chinese University of Hong Kong, Hong Kong SAR
Benjamin Wiley, Duke University, USA
Xiaojun Wu, University of Science and Technology of China, China
Yujie Xiong, University of Science and Technology of China, China
Hongxing Xu, Wuhan University, China
Lin Xu, Nanjing Normal University, China
Ya Yang, Beijing Institute of Nanoenergy and Nanosystems, China
Jinhua Ye, National Institute for Materials Science, Japan
Xiao Cheng Zeng, University of Nebraska-Lincoln, USA
Gang Zhang, Agency for Science, Technology and Research, Singapore
Hua Zhang, City University of Hong Kong, China
Miqin Zhang, University of Washington, USA
Yuliang Zhao, National Center for Nanoscience and Technology, China

Information for Authors

Full details on how to submit material for publication in Nanoscale are given in the Instructions for Authors (available from <http://www.rsc.org/authors>). Submissions should be made via the journal's homepage: rsc.li/nanoscale

Authors may reproduce/republish portions of their published contribution without seeking permission from the Royal Society of Chemistry, provided that any such republication is accompanied by an acknowledgement in the form: (Original Citation)–Reproduced by permission of the Royal Society of Chemistry.

This journal is © The Royal Society of Chemistry 2023.

Apart from fair dealing for the purposes of research or private study for non-commercial purposes, or criticism or review, as permitted under the Copyright, Designs and Patents Act 1988 and the Copyright and Related Rights Regulation 2003, this publication may only be reproduced, stored or transmitted, in any form or by any means, with the prior permission in writing of the Publishers or in the case of reprographic reproduction in accordance with the terms of licences issued by the Copyright Licensing Agency in the UK. US copyright law is applicable to users in the USA.

Registered charity number: 207890

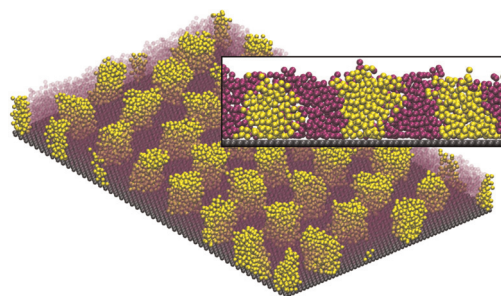


PAPERS

6901

Surface enrichment dictates block copolymer orientation

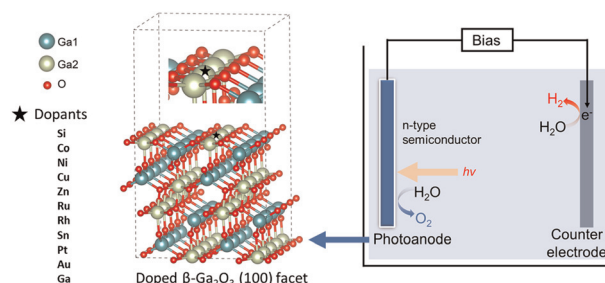
Suwon Bae, Marcus M. Noack and Kevin G. Yager*



6913

Theoretical screening of single atom doping on β -Ga₂O₃ (100) for photoelectrochemical water splitting with high activity and low limiting potential

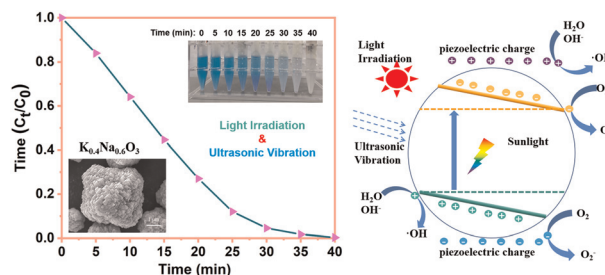
Sijia Fu, David Lewis, Philip van Eyk, Petar Atanackovic and Yan Jiao*



6920

Piezoelectrically enhanced photocatalysis of K_xNa_{1-x}NbO₃ (KNN) microstructures for efficient water purification

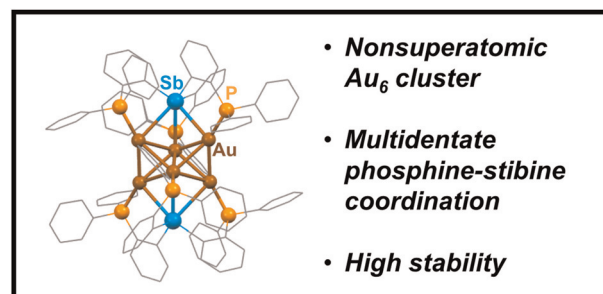
Runjiang Guo, Mengqian Liu, Yurui Xing, Tanglong Bai, Chenglong Zhao, Haolin Huang and Hongti Zhang*



6934

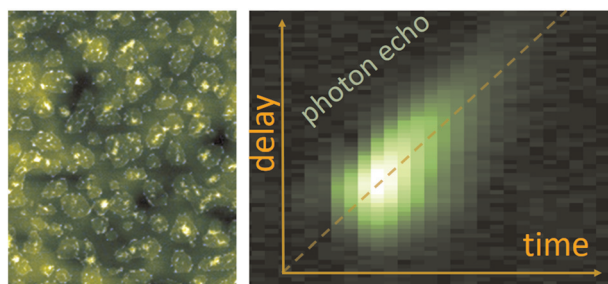
A first glance into mixed phosphine–stibine moieties as protecting ligands for gold clusters

Kundan K. Singh, Ayan Bhattacharyya, Shana Havenridge, Mohamed Ghabin, Hagan Ausmann, Maxime A. Siegler, Christine M. Aikens* and Anindita Das*



PAPERS

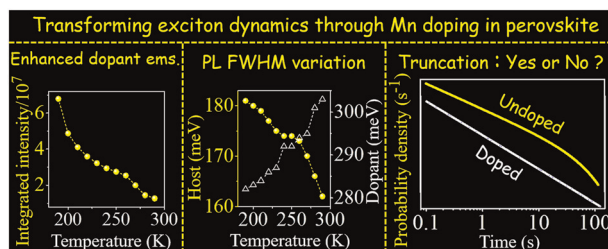
6941



Coherent imaging and dynamics of excitons in MoSe₂ monolayers epitaxially grown on hexagonal boron nitride

Karolina Ewa Potczyńska*, Simon Le Denmat, Takashi Taniguchi, Kenji Watanabe, Marek Potemski, Piotr Kossacki, Wojciech Pacuski and Jacek Kasprzak*

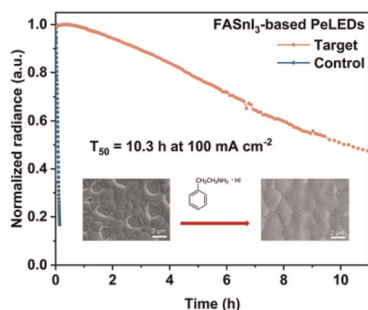
6947



Transforming exciton dynamics in perovskite nanocrystal through Mn doping

Soumen Mukherjee, Swarnali Ghosh, Dibyendu Biswas, Mainak Ghosal, Kheyali De and Prasun K. Mandal*

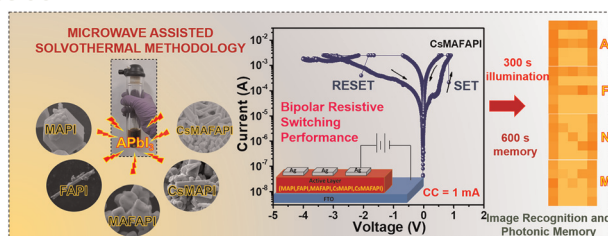
6954



Stabilizing FASnI₃-based perovskite light-emitting diodes with crystallization control

Guoling Zhang, Shiyu Xing, Xuhui Cao, Baodan Zhao* and Dawei Di*

6960



Revealing the effect of substitutional cation doping in the A-site of nanoscale APbI₃ perovskite layers for enhanced retention and endurance in optoelectronic resistive switching for non-volatile bipolar memory devices

Twinkle George and Arumugam Vadivel Murugan*

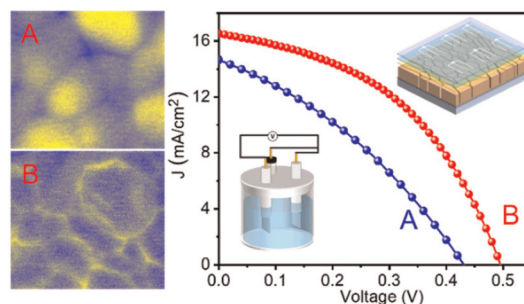


PAPERS

6976

GeSe-evoked synchronous strategy for electrodeposited CZGSe solar cells

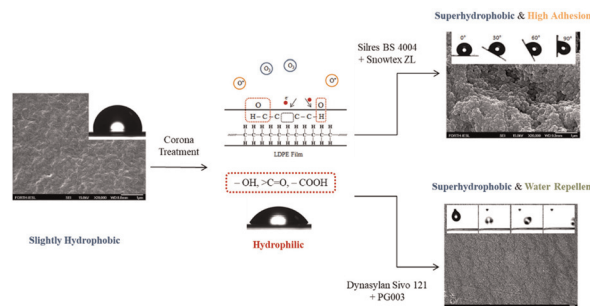
Jingling Liu, Kang Gao, Hang Cai, Xinyu Wu, Xinsheng Liu, Ke Cheng* and Zuliang Du*



6984

Modifying flexible polymer films towards superhydrophobicity and superoleophobicity by utilizing water-based nanohybrid coatings

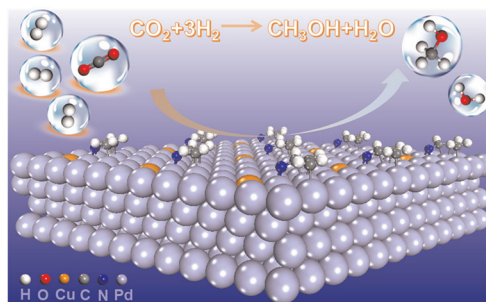
Fanourios Krasanakis, Thaleia-Michaela Chatzaki, Kiriaki Chrissopoulou* and Spiros H. Anastasiadis*



6999

Constructing imine groups on the surface of Cu₁/Pd(111) as a novel strategy for CO₂ hydrogenation to methanol

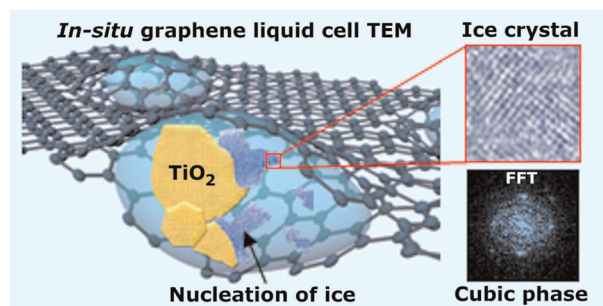
Sanmei Wang, Qi Li, Yue Xin, Sunpei Hu, Xiaoxi Guo, Yong Zhang, Ling Zhang, Bingang Chen*, Wenhua Zhang* and Liangbing Wang*



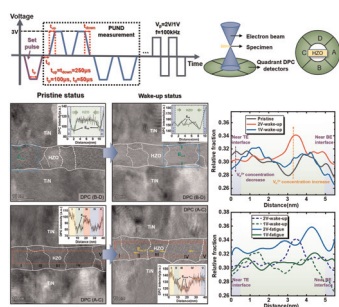
7006

Real-time TEM observations of ice formation in graphene liquid cell

Abhijit H. Phakatkar, Constantine M. Megaridis, Tolou Shokuhfar* and Reza Shahbazian-Yassar*



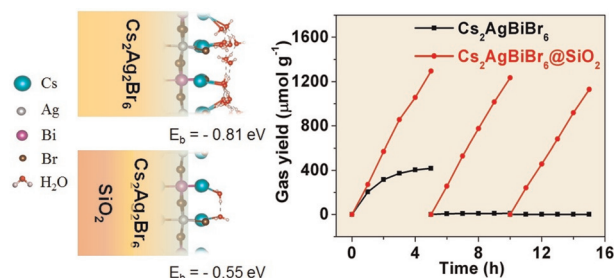
7014



First direct observation of the built-in electric field and oxygen vacancy migration in ferroelectric $\text{Hf}_{0.5}\text{Zr}_{0.5}\text{O}_2$ film during electrical cycling

Liang Chen, Zhongxin Liang, Shixuan Shao, Qianqian Huang,* Kechao Tang* and Ru Huang*

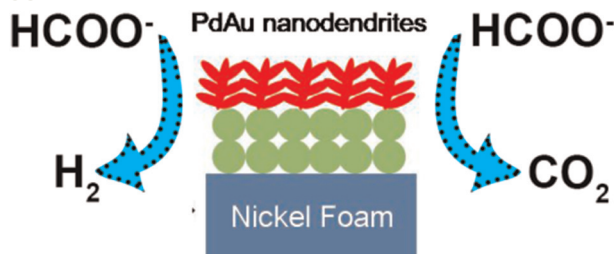
7023



In situ growth of lead-free halide perovskites into SiO_2 sub-microcapsules toward water-stable photocatalytic CO_2 reduction

Jie Liu, Zihou Wu, Feng Zhang,* Mengzhen Zhao, Chao Li, Jie Li,* Bo Wen and Feijiu Wang*

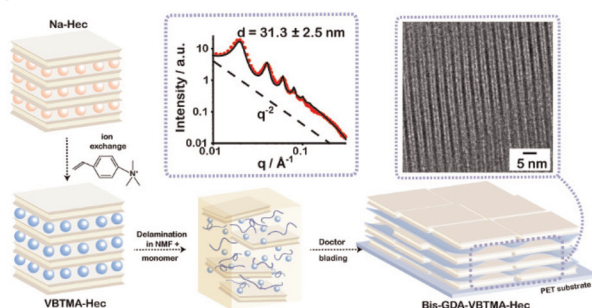
7032



Nickel-supported PdM (M = Au and Ag) nanodendrites as formate oxidation (electro) catalytic anodes for direct fuel cells and hydrogen generation at room temperature

Bowei Pan, Shuang Shan, Junpeng Wang, Quan Tang, Longfei Guo, Tao Jin, Qiao Wang, Zhen Li, Muhammad Usman and Fuyi Chen*

7044



Fabrication of Bragg stack films of clay nanosheets and polycations *via* co-polymerization of intercalated monomers and functional interlayer cations

Dominik Schuchardt, Sabine Rosenfeldt, Hussein Kalo and Josef Breu*

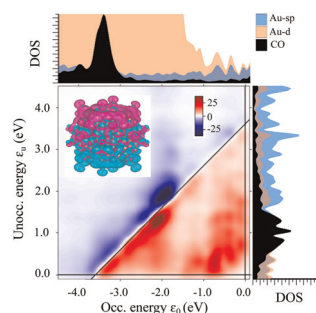


PAPERS

7051

A comprehensive investigation of the plasmonic-photocatalytic properties of gold nanoparticles for CO₂ conversion to chemicals

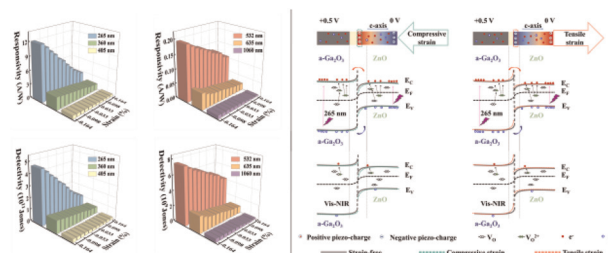
Maryam Soleimani and Mahdi Pourfath*



7068

Piezo-phototronic effect regulated broadband photoresponse of α -Ga₂O₃/ZnO heterojunction

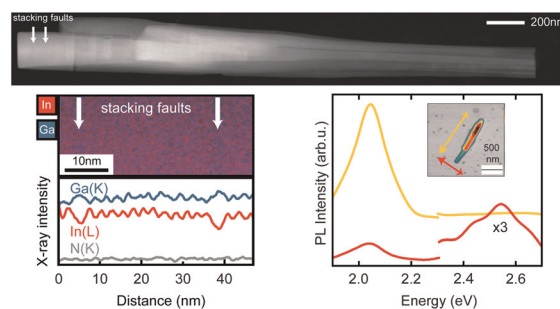
Jiantao Wang, Yan Zhou, Zihan Wang, Boying Wang, Yongqiu Li, Banghao Wu, Chunlin Hao, Yaju Zhang* and Haiwu Zheng*



7077

Origin of the spectral red-shift and polarization patterns of self-assembled InGaN nanostructures on GaN nanowires

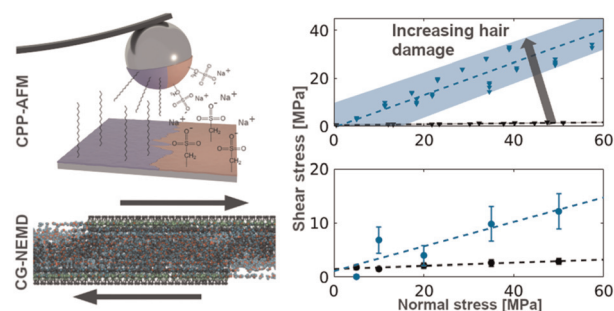
Maximilian Ries, Felix Nippert, Benjamin März, Manuel Alonso-Orts, Tim Grieb, Rudolfo Hötzel, Pascal Hille, Pouria Emtenani, Eser Metin Akinoglu, Eugen Speiser, Julian Plaickner, Jörg Schörmann, Matthias Auf der Maur, Knut Müller-Caspary, Andreas Rosenauer, Norbert Esser, Martin Eickhoff and Markus R. Wagner*



7086

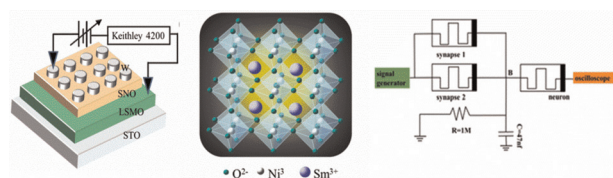
Nanoscale friction of biomimetic hair surfaces

Erik Weiland*, James P. Ewen*, Yuri Roiter, Peter H. Koenig, Steven H. Page, Francisco Rodriguez-Ropero, Stefano Angioletti-Uberti and Daniele Dini



PAPERS

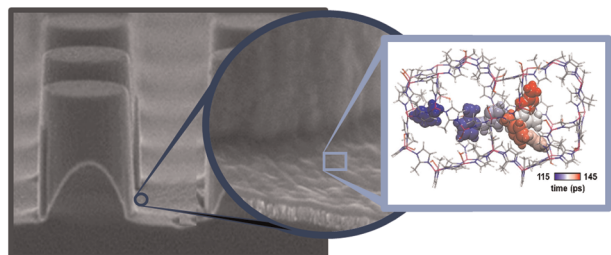
7105



A SmNiO_3 memristor with artificial synapse function properties and the implementation of Boolean logic circuits

Lei Li, Dongqing Yu, Yiheng Wei, Yong Sun, Jianhui Zhao, Zhenyu Zhou, Jie Yang, Zichang Zhang and Xiaobing Yan*

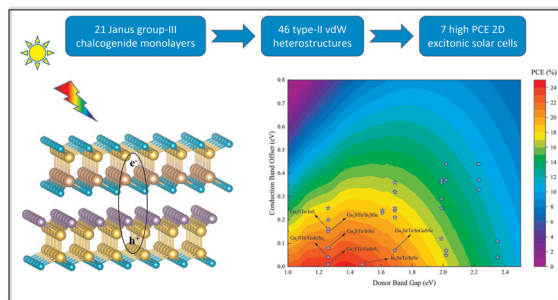
7115



ZIF-8 thin films by a vapor-phase process: limits to growth

Virginie Perrot, Arthur Roussey, Anass Benayad, Marc Veillerot, Denis Mariolle, Albert Solé-Daura, Caroline Mellot-Draznieks, Florence Ricoul, Jérôme Canivet, Elsje Alessandra Quadrelli* and Vincent Jousseume*

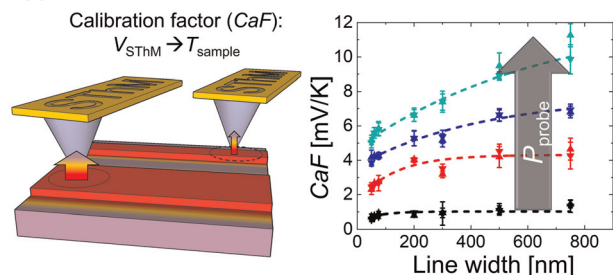
7126



Solar cells based on 2D Janus group-III chalcogenide van der Waals heterostructures

M. Bikerouin,* O. Chdil and M. Balli*

7139



Nanoscale temperature sensing of electronic devices with calibrated scanning thermal microscopy

Timm Swoboda, Nicolás Wainstein, Sanchit Deshmukh, Çağıl Köroğlu, Xing Gao, Mario Lanza, Hans Hilgenkamp, Eric Pop, Eilam Yalon and Miguel Muñoz Rojo*

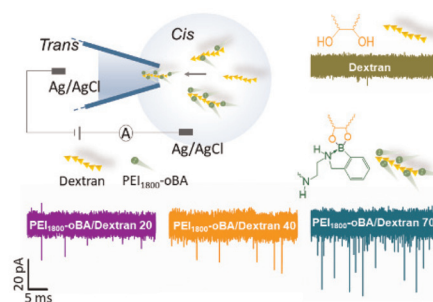


PAPERS

7147

Phenylboronic acid-modified polyethyleneimine assisted neutral polysaccharide detection and weight-resolution analysis with a nanopipette

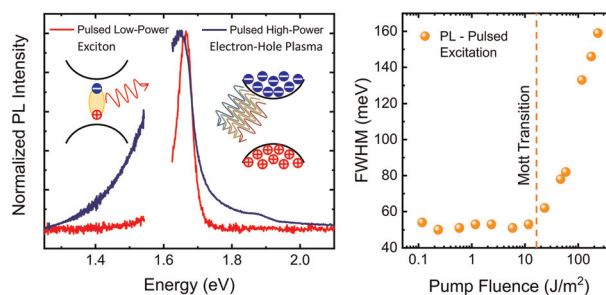
Wanyi Xie, Shixuan He,* Shaoxi Fang, Rong Tian, Liyuan Liang and Deqiang Wang*



7154

Ultrafast hot electron–hole plasma photoluminescence in two-dimensional semiconductors

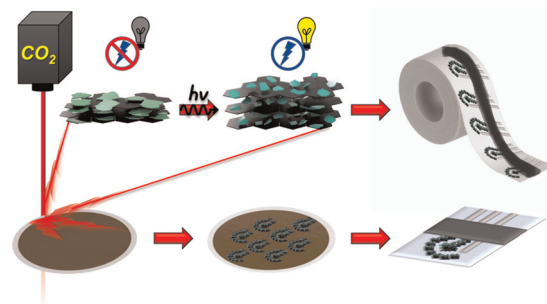
Frederico B. Sousa, Raúl Perea-Causin, Sean Hartmann, Lucas Lafetá, Bárbara Rosa, Samuel Brem, Chirag Palekar, Stephan Reitzenstein, Achim Hartschuh, Ermin Malic and Leandro M. Malard*



7164

Freestanding laser-induced two dimensional heterostructures for self-contained paper-based sensors

Flavio Della Pelle, Qurat Ul Ain Bukhari, Ruslán Alvarez Diduk, Annalisa Scroccarello, Dario Compagnone* and Arben Merkoçi*



7176

How structural and vibrational features affect optoelectronic properties of non-stoichiometric quantum dots: computational insights

Manav Bhati, Sergei A. Ivanov, Thomas P. Senftle, Sergei Tretiak* and Dibyajyoti Ghosh*

