

Journal of Materials Chemistry A

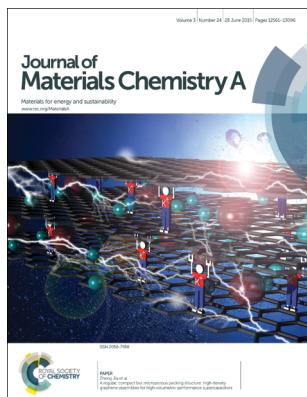
Materials for energy and sustainability

www.rsc.org/MaterialsA

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.

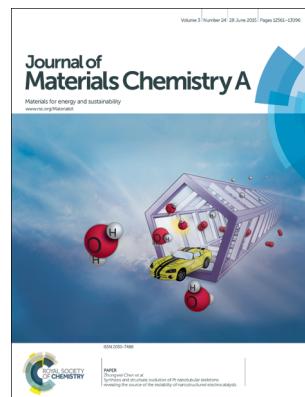
IN THIS ISSUE

ISSN 2050-7488 CODEN JMCAET 3(24) 12561–13096 (2015)



Cover

See Zheng Jia et al.,
pp. 12653–12662.
Image reproduced by
permission of Zheng Jia from
J. Mater. Chem. A,
2015, 3, 12653.



Inside cover

See Zhongwei Chen et al.,
pp. 12663–12671.
Image reproduced by
permission of Zhongwei Chen
from *J. Mater. Chem. A*,
2015, 3, 12663.

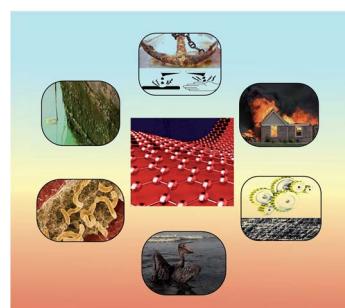
REVIEW

12580

Graphene: a multipurpose material for protective coatings

Md J. Nine, Martin A. Cole, Diana N. H. Tran
and Dusan Lasic*

This article reviews and discusses the potentialities, challenges and progress of graphene for application in multifunctional protective coatings.



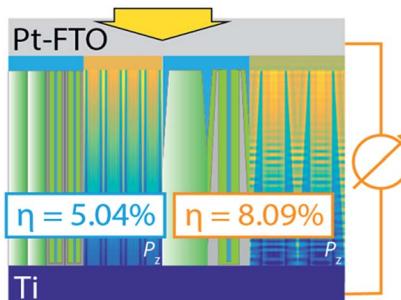
COMMUNICATIONS

12603

Conical-shaped titania nanotubes for optimized light management in DSSCs reach back-side illumination efficiencies > 8%

Seulgi So, Arian Kriesch, Ulf Peschel and Patrik Schmuki*

We introduce the anodic growth of conical-shaped TiO₂ nanotube arrays and exploit their optimized absorption profile in high efficiency DSSCs.



Journal of Materials Chemistry A

www.rsc.org/materialsA

Journal of Materials Chemistry A is a weekly journal in the materials field. The journal is interdisciplinary, publishing work of international significance on all aspects of materials chemistry related to energy and sustainability. Articles cover the fabrication, properties and applications of materials.

Editorial board

Editor-in-Chief

Nazario Martin, Universidad Complutense Madrid, Spain

Deputy Editor-in-Chief

Hiroshi Imahori, Kyoto University, Japan

Associate editors

Michael Chabinyc, University of California, Santa Barbara, USA
Goutam De, CSIR-Central Glass and Ceramic Research Institute, Kolkata, India
Mohamed Eddaoudi, King Abdullah University of Science and Technology, Saudi Arabia
Yan Li, Peking University, China
Zhiqun Lin, Georgia Institute of Technology, USA

David Lou, Nanyang Technological University, Singapore
Christine Luscombe, University of Washington, Seattle, USA
Frank Osterloh, University of California, Davis, USA
Shizhang Qiao, University of Adelaide, Australia
Stephen Skinner, Imperial College London, UK
Magdalena Titirici, Queen Mary University of London, UK

Advisory board

J.-S. Chen, Shanghai Jiao Tong University, China
G. Cooke, WestCHEM, University of Glasgow, UK
X. Feng, Dresden University of Technology, Germany
Y. H. Hu, Michigan Technological University, USA
J. Huang, Northwestern University, USA
T. Ishihara, Kyushu University, Japan
S. Islam, University of Bath, UK
H. Kageyama, Kyoto University, Japan
J. Lin, East China University of Science and Technology, China

B. Lotsch, Max Planck Institute for Solid State Research, Stuttgart, Germany
M. Maaza, iThemba Laboratory for Accelerator Based Sciences, South Africa
A. K. Nandi, IACS, India
L. Nazar, University of Waterloo, Canada
M. Niederberger, ETH Zürich, Switzerland
N. Ravishankar, Indian Institute of Science, India
Y. Shimakawa, Kyoto University, Japan

C.-Y. Su, Sun Yat-Sen University, China
H. Teng, National Cheng Kung University, Chinese Taipei
V. Thangadurai, University of Calgary, Canada
M. Wei, Beijing University of Chemical Technology, China
X.S. Zhao, University of Queensland, Australia
G. Zheng, Fudan University, China

Information for authors

Full details on how to submit material for publication in *Journal of Materials Chemistry A* are given in the Instructions for Authors (available from <http://www.rsc.org/authors>). Submissions should be made via the journal's homepage: <http://www.rsc.org/materialsA>.

Submissions: The journal welcomes submissions of manuscripts for publication as Full Papers, Communications, Reviews, Highlights and Applications. Full Papers and Communications should describe original work of high quality and impact which must highlight the novel properties or applications (or potential properties/applications) of the materials studied.

Colour figures are reproduced free of charge. Additional details are available from the Editorial Office or <http://www.rsc.org/authors>. 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 2015. 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.

⊗ The paper used in this publication meets the requirements of ANSI/NISO Z39.48–1992 (Permanence of Paper).

Registered Charity No. 207890.

Editorial staff

Executive editor

Fiona McKenzie

Editorial production manager

Will Dennis

Deputy editor

Sam Keltie

Development editor

Sarah Thirkell

Publishing editors

Polly-Anna Ashford, Emma Cooper, Lyn Jennings, Carole Martin, Emma Stephen, Polly Wilson, Jason Woolford, Ruth Zadik

Publishing assistants

Aliya Anwar, Emily Finney, Julie Ann Roszkowski

Publisher

Liz Dunn

For queries about submitted papers, please contact Will Dennis, Editorial production manager in the first instance. E-mail: materialsA@rsc.org

For pre-submission queries please contact Fiona McKenzie, Executive editor. E-mail: materialsA-rsc@rsc.org

Journal of Materials Chemistry A (print: ISSN 2050-7488; electronic: ISSN 2050-7496) 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 RSC 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

2015 Annual (print+electronic) subscription price: £1747; \$2970. 2015 Annual (electronic) subscription price: £1660; \$2822. 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.

The Royal Society of Chemistry takes reasonable care in the preparation of this publication but does not accept liability for the consequences of any errors or omissions. Inclusion of an item in this publication does not imply endorsement by The Royal Society of Chemistry of the content of the original documents to which that item refers.

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



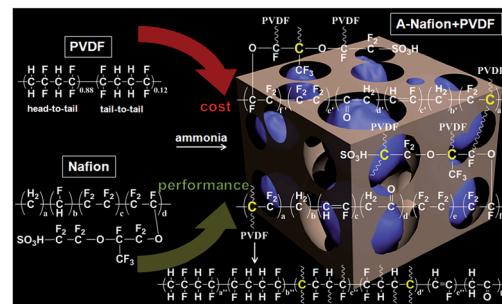
COMMUNICATIONS

12609

Ammonia-assisted dehydrofluorination between PVDF and Nafion for highly selective and low-cost proton exchange membranes: a possible way to further strengthen the commercialization of Nafion

Kai Feng, Beibei Tang* and Peiyi Wu*

Low-cost PEM with high performance is prepared via dehydrofluorination reactions between PVDF and Nafion with the aid of ammonia.

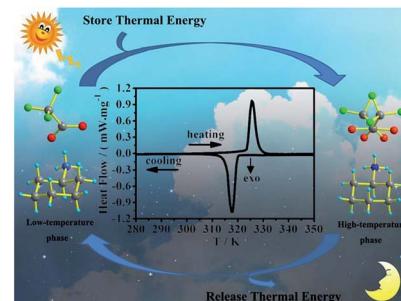


12616

Thermal energy storage in a supramolecular assembly of $[C_6H_{11}NH_3]^+[CF_3COO]^-$ (C_6H_{11} = cyclohexyl)

Jianbin Guo, Wen Tang, Binbin Wu, Haixia Zhao,* Lasheng Long* and Lansun Zheng

Investigation on the structure of new compound $[C_6H_{11}NH_3]^+[CF_3COO]^-$ (**1**) reveals that the disorder of the anions plays a key role in the thermal energy storage. Studies on the thermal and physical properties of **1** indicate that utilization of the sensible heat in **1** can significantly enhance its ability to store thermal energy.

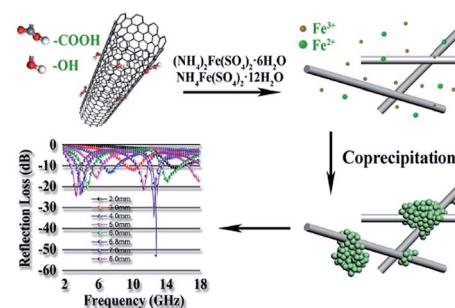


12621

3D Fe_3O_4 nanocrystals decorating carbon nanotubes to tune electromagnetic properties and enhance microwave absorption capacity

Yi-Hua Chen, Zi-Han Huang, Ming-Ming Lu, Wen-Qiang Cao, Jie Yuan,* De-Qing Zhang* and Mao-Sheng Cao*

3D Fe_3O_4 -MWCNTs, a novel nanostructure, exhibited excellent microwave absorption due to the synergy of dielectric loss and magnetic loss and the enhancement effect of multiple interfaces.

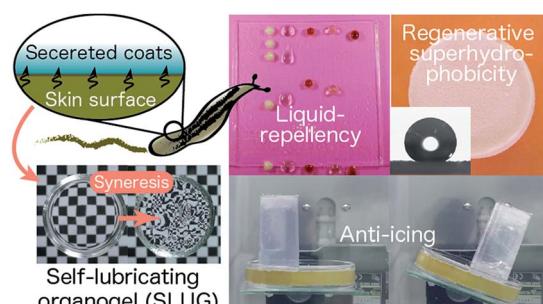


12626

Self-lubricating organogels (SLUGs) with exceptional syneresis-induced anti-sticking properties against viscous emulsions and ices

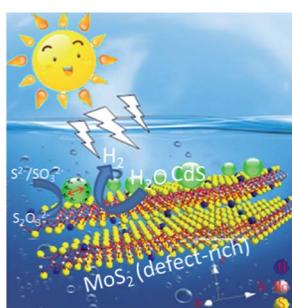
Chihiro Urata, Gary J. Dunderdale, Matt W. England and Atsushi Hozumi*

"Self-lubricating organogels (SLUGs)" showing exceptional surface properties are prepared via a crosslinking of polydimethylsiloxanes in the presence of organic liquids.



COMMUNICATIONS

12631

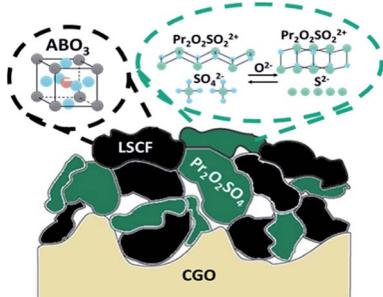


An efficient cocatalyst of defect-decorated MoS₂ ultrathin nanoplates for the promotion of photocatalytic hydrogen evolution over CdS nanocrystal

Jinhua Xiong, Yuhao Liu, Dengke Wang, Shijing Liang, Weiming Wu and Ling Wu*

A defect-rich MoS₂ ultrathin nanoplate was obtained via a facile method, which showed an excellent promotion for photocatalytic hydrogen evolution over CdS nanocrystals due to its unique structural features.

12636

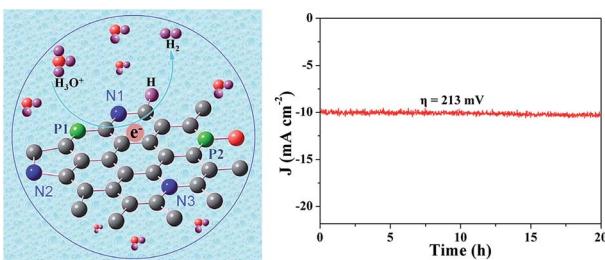


Pr₂O₇SO₄–La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3–δ}: a new category of composite cathode for intermediate temperature-solid oxide fuel cells

Francisco J. A. Loureiro, Tao Yang, Daniel G. Stroppa and Duncan P. Fagg*

A new category of composite cathodes is investigated, containing an oxysulphate oxygen storage material. A stable composite Pr₂O₇SO₄–La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3–δ} is formed, providing significant improvement in the total polarization resistance, predominantly due to improvements in interfacial charge transfer and surface exchange.

12642

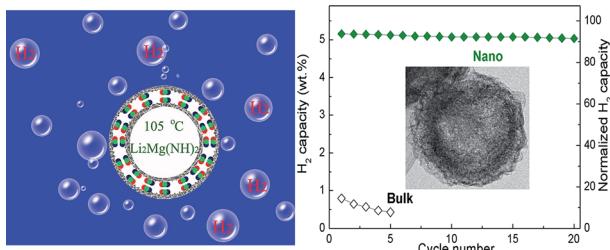


Highly dual-doped multilayer nanoporous graphene: efficient metal-free electrocatalysts for the hydrogen evolution reaction

Hongliang Jiang, Yihua Zhu,* Yunhe Su, Yifan Yao, Yanyan Liu, Xiaoling Yang and Chunzhong Li

Nitrogen and phosphorus dual-doped multilayer graphene exhibits excellent and robust electrocatalytic performance in the hydrogen evolution reaction (HER).

12646



Nano-confined multi-synthesis of a Li–Mg–N–H nanocomposite towards low-temperature hydrogen storage with stable reversibility

Guanglin Xia, Xiaowei Chen, Cuifeng Zhou, Chaofeng Zhang, Dan Li, Qinfen Gu, Zaiping Guo,* Huakun Liu, Zongwen Liu and Xuebin Yu*

De-/re-hydrogenation of Li₂Mg(NH)₂ at a temperature as low as 105 °C and stable reversibility through up to 20 cycles are successfully achieved by the nanosize-induced effects by double-shelled hollow carbon spheres.

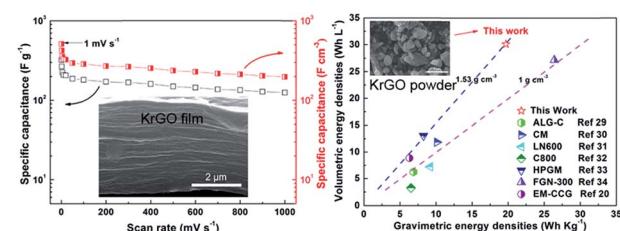
PAPERS

12653

A regular, compact but microporous packing structure: high-density graphene assemblies for high-volumetric-performance supercapacitors

Daoqing Liu, Zheng Jia,* Jiaxiong Zhu and Dianlong Wang

A graphene packing structure with the utmost compactness and suitable porosity was realized to achieve high volumetric performances for supercapacitors.

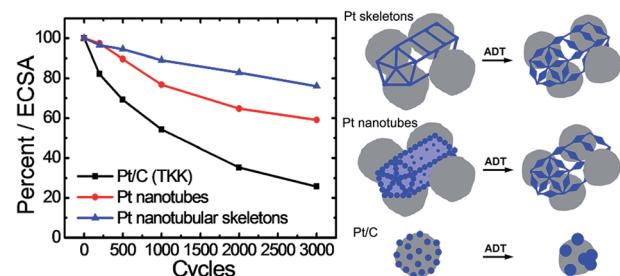


12663

Synthesis and structural evolution of Pt nanotubular skeletons: revealing the source of the instability of nanostructured electrocatalysts

Rongyue Wang, Drew C. Higgins, Sagar Prabhudev, Dong Un Lee, Ja-Yeon Choi, Md Ariful Hoque, Gianluigi A. Botton and Zhongwei Chen*

Grain boundaries are revealed to be a primary source of one-dimensional Pt nanostructure instability by comparing the structural evolution processes of rationally synthesized tubular structures with Pt/C.

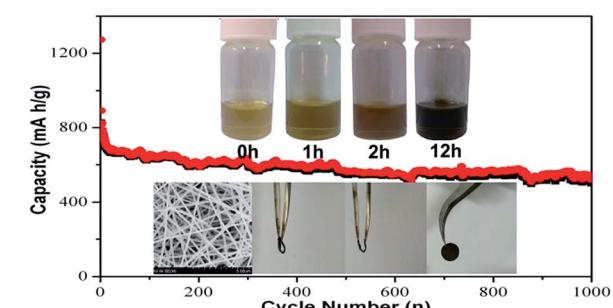


12672

Stannous ions reducing graphene oxide at room temperature to produce SnO_x -porous, carbon-nanofiber flexible mats as binder-free anodes for lithium-ion batteries

Feilong Yan, Xuan Tang, Yuehua Wei, Libao Chen, Guozhong Cao,* Ming Zhang* and Taihong Wang

SnO_x -porous carbon nanofiber flexible mats deliver a high reversible capacity of 545 mA h g^{-1} after 1000 cycles at 200 mA g^{-1} .

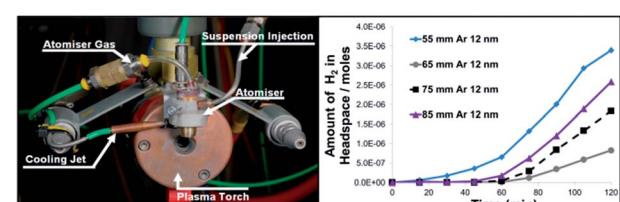


12680

Suspension plasma sprayed coatings using dilute hydrothermally produced titania feedstocks for photocatalytic applications

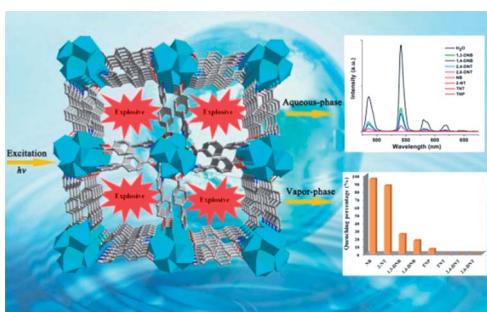
B. W. Robinson,* C. J. Tighe, R. I. Gruar, A. Mills, I. P. Parkin, A. K. Tabecki, H. L. de Villiers Lovelock and J. A. Darr

SPS titania coatings, with applications in water purification, were formed using continuous hydrothermally produced feedstocks for the first time. Coating photoactivity was compared with CVD and P25 analogues.



PAPERS

12690

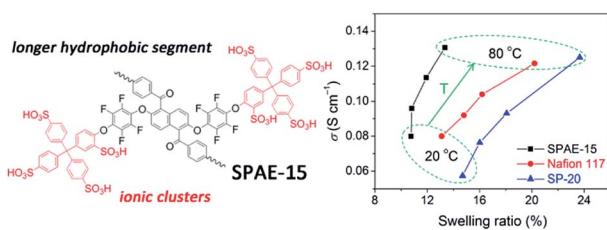


Aqueous- and vapor-phase detection of nitroaromatic explosives by a water-stable fluorescent microporous MOF directed by an ionic liquid

Jianhua Qin, Bing Ma, Xiao-Fei Liu, Hong-Lin Lu, Xi-Yan Dong, Shuang-Quan Zang* and Hongwei Hou*

Aqueous- and vapor-phase detection of nitroaromatic explosives by a water-stable fluorescent microporous MOF directed by an ionic liquid.

12698

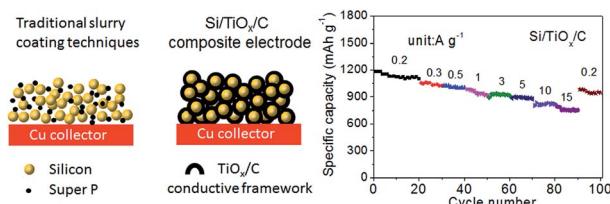


Graft octa-sulfonated poly(arylene ether) for high performance proton exchange membrane

Sinan Feng, Guibin Wang, Haibo Zhang and Jinhui Pang*

A novel octa-sulfonated poly(arylene ether) was combined with a longer hydrophobic backbone and grafted with ionic clusters, exhibiting high proton conductivity and excellent dimensional stability.

12709

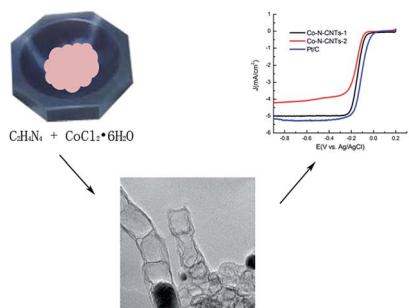


Interconnected $\text{TiO}_x/\text{carbon}$ hybrid framework incorporated silicon for stable lithium ion battery anodes

Ming-Shan Wang, Wei-Li Song and Li-Zhen Fan*

Unique three-dimensional porous silicon/TiO_x/C (Si/TiO_x/C) binder free composite electrodes were scalably fabricated. By taking advantage of the conductive TiO_x/C frameworks, the Si/TiO_x/C electrodes exhibited superior cycling and rate performance.

12718



One-step synthesis of cobalt and nitrogen co-doped carbon nanotubes and their catalytic activity for the oxygen reduction reaction

Shaofang Fu, Chengzhou Zhu, He Li, Dan Du and Yuehe Lin*

One-step synthesis of cobalt and nitrogen co-doped carbon nanotubes and their catalytic activity for the oxygen reduction reaction.

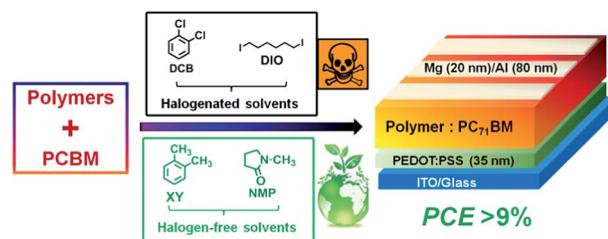
PAPERS

12723

A universal halogen-free solvent system for highly efficient polymer solar cells

Wenchao Zhao, Long Ye, Shaoqing Zhang, Mingliang Sun* and Jianhui Hou*

A high power conversion efficiency over 9.4% was realized in polymer solar cells by halogen-free solvent processing.

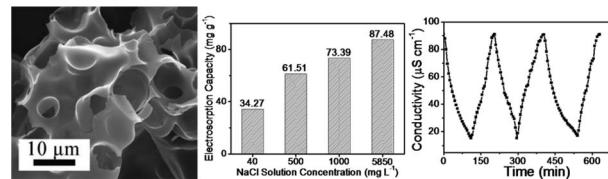


12730

Enhancement of capacitive deionization capacity of hierarchical porous carbon

Lumeng Chao, Zhenyu Liu, Guoxin Zhang, Xiaona Song, Xiaodong Lei, Michael Noyong, Ulrich Simon, Zheng Chang* and Xiaoming Sun*

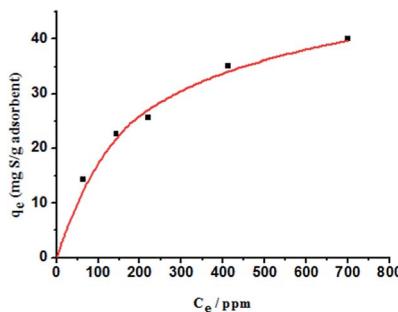
Hierarchical porous carbon derived from the one-step pyrolysis of ethylenediaminetetraacetic acid exhibited impressive capacitive deionization capacity.



12738

Carbon-doped porous boron nitride: metal-free adsorbents for sulfur removal from fuels

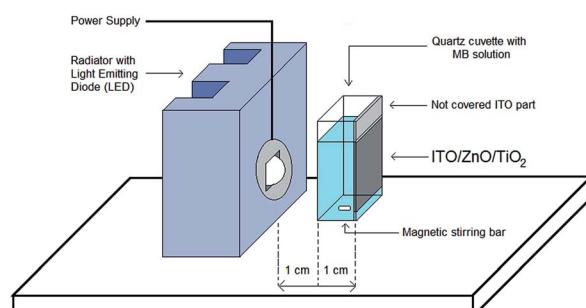
Jun Xiong, Wenshuai Zhu,* Hongping Li, Lei Yang, Yanhong Chao, Peiwen Wu, Suhang Xun, Wei Jiang, Ming Zhang and Huaming Li*

Novel carbon-doped porous boron nitride has been successfully prepared by using [Bmim]BF₄ as a soft template and the carbon source. The metal-free porous C-BN displayed one of the highest adsorption capacities for dibenzothiophene reported up to now.

12748

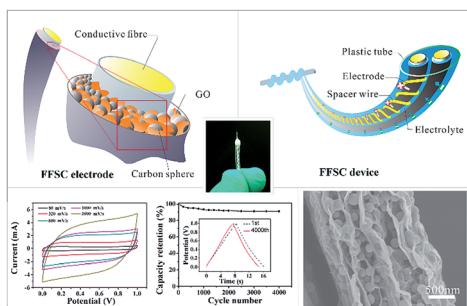
ZnO nanorods covered with a TiO₂ layer: simple sol-gel preparation, and optical, photocatalytic and photoelectrochemical properties

Maciej Kwiatkowski,* Igor Bezverkhyy and Magdalena Skompska

In this work, composite core-shell ZnO/TiO₂ materials were fabricated by deposition of TiO₂ layers via sol-gel method on ZnO nanorods hydrothermally grown on ITO electrode.

PAPERS

12761

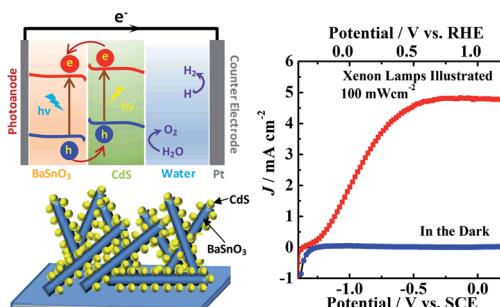


Fibrous and flexible supercapacitors comprising hierarchical nanostructures with carbon spheres and graphene oxide nanosheets

Xiong Zhang, Yuekun Lai, Mingzheng Ge, Yixin Zheng, Ke-Qin Zhang* and Zhiqun Lin*

A fibrous and flexible graphene nano-sheet and carbon nano-sphere composite supercapacitor is developed by a novel electrochemical approach and its stable performance with a highly enhanced capacitance is demonstrated.

12769

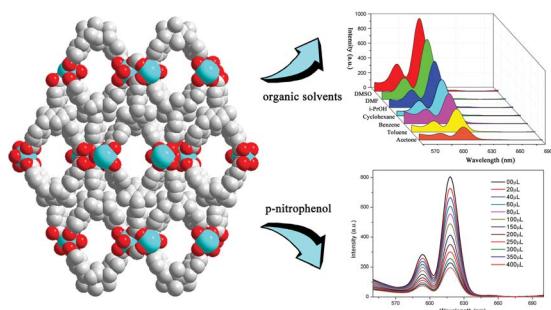


Synthesis of cadmium sulfide quantum dot-decorated barium stannate nanowires for photoelectrochemical water splitting

Zemin Zhang, Xiaodong Li, Caitian Gao, Feng Teng, Youqing Wang, Lulu Chen, Weihua Han,* Zhenxing Zhang and Erqing Xie*

A staggered gap heterojunction has been built with BaSnO₃ nanowires and CdS quantum dots for highly efficient water splitting photoanodes.

12777

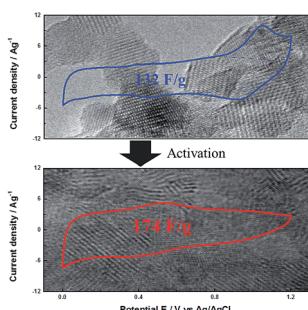


Lanthanide metal–organic frameworks containing a novel flexible ligand for luminescence sensing of small organic molecules and selective adsorption

Xiaoqing Wang, Liangliang Zhang, Jie Yang, Fuling Liu, Fangna Dai, Rongming Wang and Daofeng Sun*

Lanthanide MOFs with fluorescent sensing and selective adsorption have been synthesized and characterized based on a novel flexible ligand.

12786



Charge storage mechanism of activated manganese oxide composites for pseudocapacitors

Tzu-Ho Wu, David Hesp, Vin Dhanak, Christopher Collins, Filipe Braga, Laurence J. Hardwick* and Chi-Chang Hu*

Manganese oxides can undergo an electrochemical activation step that leads to greater capacitances, of which the structural change and mechanism remains poorly understood.

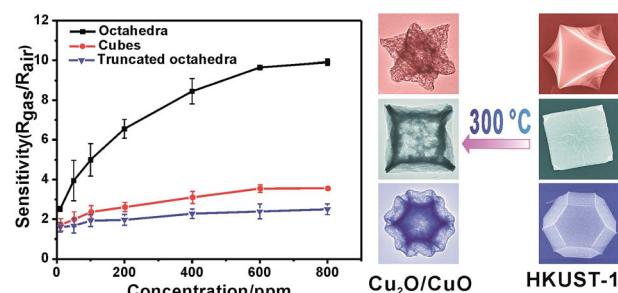
PAPERS

12796

Synthesis of porous Cu₂O/CuO cages using Cu-based metal–organic frameworks as templates and their gas-sensing properties

Yiting Wang, Yinyun Lü, Wenwen Zhan, Zhaoxiong Xie, Qin Kuang* and Lansun Zheng

Porous Cu₂O/CuO polyhedral cages with excellent gas-sensing properties were successfully fabricated by thermal decomposition of Cu-based metal–organic frameworks composed of polyhedral crystals.

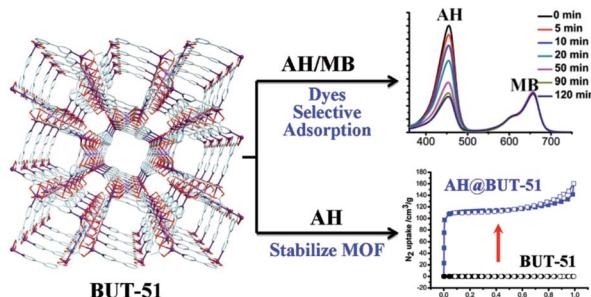


12804

Size-exclusive and coordination-induced selective dye adsorption in a nanotubular metal–organic framework

Yi Han, Shunan Sheng, Fan Yang, Yabo Xie, Minjian Zhao and Jian-Rong Li*

A nanotubular MOF, BUT-51, performs coordination-induced selective dye adsorption, which changes its stability and porosity to give a robust partner.

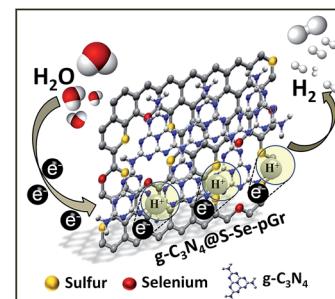


12810

Electrocatalytic hydrogen evolution using graphitic carbon nitride coupled with nanoporous graphene co-doped by S and Se

S. S. Shinde, Abdul Sami and Jung-Ho Lee*

Electrocatalytic hydrogen evolution using non-precious metals or metal-free catalysts is critically necessary because platinum-based electrocatalysts are greatly limited in scalable commercialization of hydrogen generation due to their high cost.

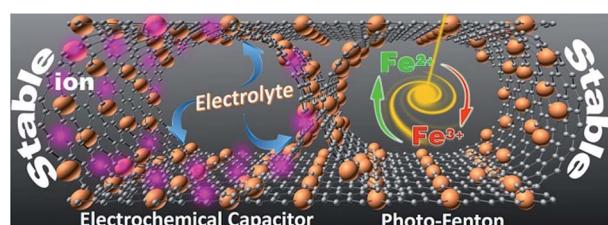


12820

Stöber-like method to synthesize ultralight, porous, stretchable Fe₂O₃/graphene aerogels for excellent performance in photo-Fenton reaction and electrochemical capacitors

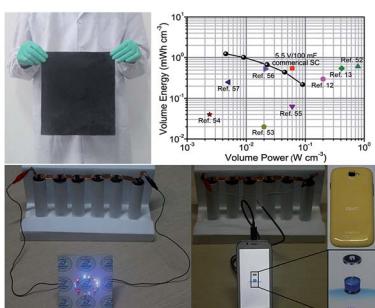
Bocheng Qiu, Mingyang Xing* and Jinlong Zhang*

The highly compressible Fe₂O₃/GAs synthesized via the Stöber-like method exhibit an outstanding performance in the photo-Fenton reaction and in electrochemical capacitors.



PAPERS

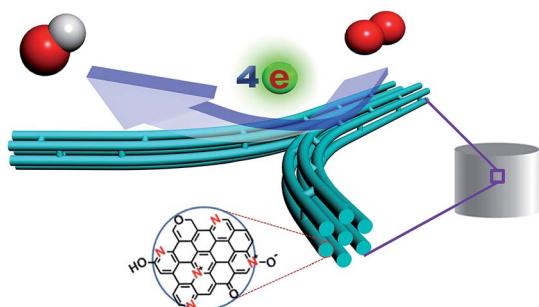
12828


Advanced solid-state asymmetric supercapacitors based on 3D graphene/MnO₂ and graphene/polypyrrole hybrid architectures

Zheye Zhang, Kai Chi, Fei Xiao* and Shuai Wang*

Two types of 3D architected electrodes, *i.e.*, graphene wrapped nickel foam Ni/GF/MnO₂ and Ni/GF/polypyrrole (PPy), were successfully fabricated for high performance flexible solid-state asymmetric supercapacitors.

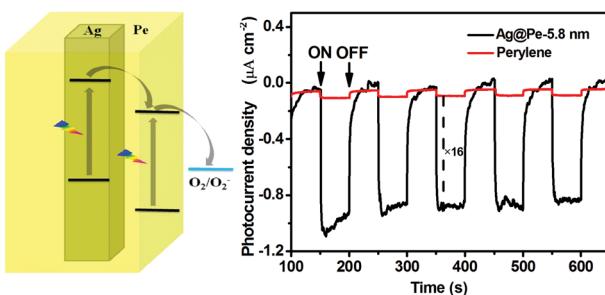
12836


A facile nanocasting strategy to nitrogen-doped porous carbon monolith by treatment with ammonia for efficient oxygen reduction

Jiacheng Wang,* Ruguang Ma, Yao Zhou and Qian Liu*

A series of three-dimensional N-doped hierarchical macro- and meso-porous carbon monoliths (NCMs), which were prepared successfully using a facile nanocasting strategy in combination with pyrolysis in NH₃, showed comparable catalytic activity but superior durability and methanol tolerance to Pt/C for the oxygen reduction reaction.

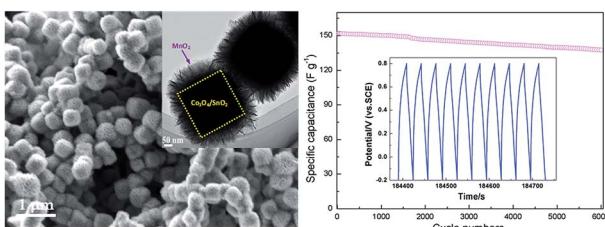
12845


Plasmon enhanced photocurrent in strongly coupled Ag@perylene core–shell nanowires

Ling Lin, Gui-Qi Gao, Qing Zhu and An-Wu Xu*

We have developed a hot electron induced photocurrent enhancement system of strongly coupled Ag@perylene core–shell nanowires.

12852


Synthesis of Co₃O₄/SnO₂@MnO₂ core–shell nanostructures for high-performance supercapacitors

Ming Huang, Xiao Li Zhao, Fei Li, Wei Li,* Bo Zhang and Yu Xin Zhang*

The synthesis of uniform Co₃O₄/SnO₂@MnO₂ core–shell nanostructures and their outstanding electrochemical properties for high-performance supercapacitors are demonstrated.

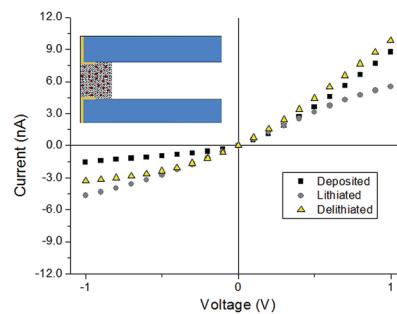
PAPERS

12858

Ionic conductivity of a single porous MnO₂ mesorod at controlled oxidation states

Timothy Plett, Trevor Gamble, Eleanor Gillette, Sang Bok Lee and Zuzanna S. Siwy*

The ionic conductivity of porous MnO₂ at the nanoscale is not well understood, despite possible importance in battery charging/discharging processes.

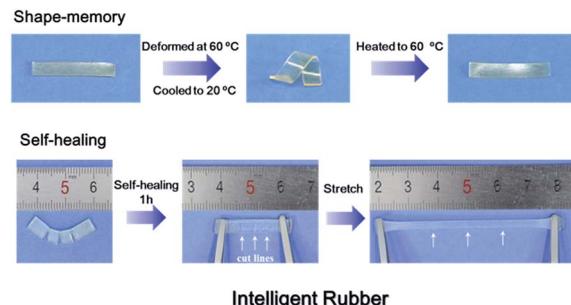


12864

Intelligent rubber with tailored properties for self-healing and shape memory

Dong Wang, Jing Guo, Huan Zhang, Beichen Cheng, Heng Shen, Ning Zhao* and Jian Xu*

Thermoreversible rubbers are prepared by the thiol-ene functionalized polybutadiene oligomers via dynamic ionic hydrogen bonds and covalent cross-links, exhibiting tailored properties for self-healing and shape memory functions.

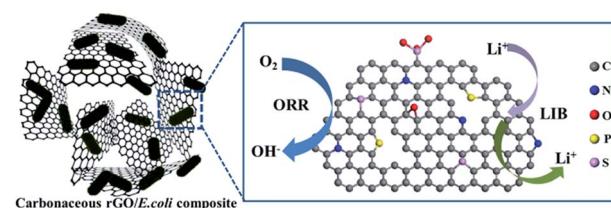


12873

Graphene–bacteria composite for oxygen reduction and lithium ion batteries

Xuewan Wang, Wei Ai, Nan Li, Ting Yu and Peng Chen*

Heteroatom-doped graphene–bacteria composite exhibits superior performance for oxygen reduction and lithium ion storage.

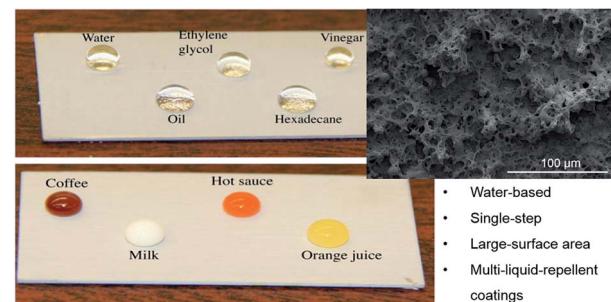


12880

Liquid repellent nanocomposites obtained from one-step water-based spray

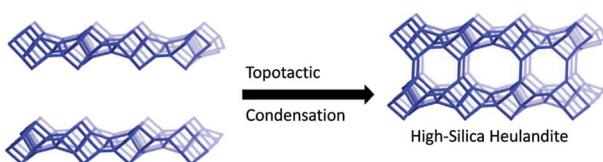
A. Milionis,* K. Dang, M. Prato, E. Loth and I. S. Bayer*

A novel, single-step, environmentally-friendly, water-based, spray-coating approach to obtain superhydrophobic and superoleophobic nanocomposite coatings made from materials with low bioaccumulation.



PAPERS

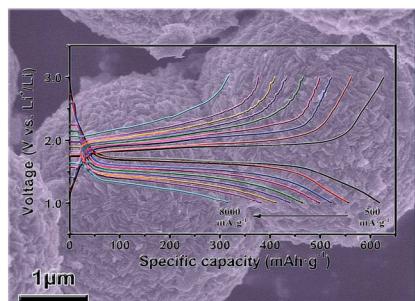
12890

**High-silica, heulandite-type zeolites prepared by direct synthesis and topotactic condensation**

Joel E. Schmidt, Dan Xie and Mark E. Davis*

High-silica heulandites prepared via topotactic condensation and direct synthesis that exhibit robust thermal stability, opening possibilities for new applications.

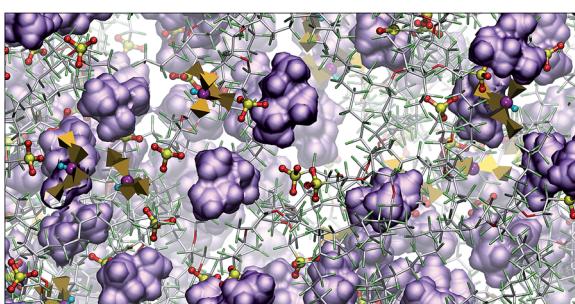
12898

**FeS₂ microspheres with an ether-based electrolyte for high-performance rechargeable lithium batteries**

Zhe Hu, Kai Zhang, Zhiqiang Zhu, Zhanliang Tao and Jun Chen*

FeS₂ microspheres assembled with nanoplates show long cycling stability and high rate performance as the cathode for rechargeable Li batteries in an optimized ether-based electrolyte.

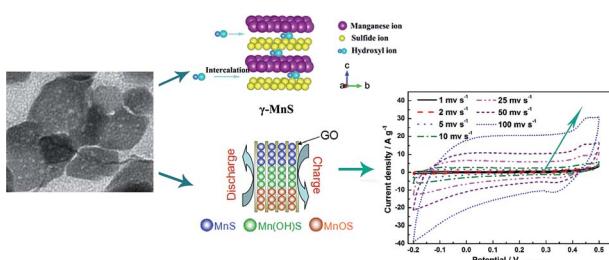
12905

**Ammonium-based protic ionic liquid doped Nafion membranes as anhydrous fuel cell electrolytes**

Anurag Prakash Sunda*

The interfacial structure correlation of cation interactions with sulfonate groups (of anion or Nafion) in a [dema][TfO] doped Nafion composite is competitive and equivalent.

12913

**Synthesis of graphene oxide anchored porous manganese sulfide nanocrystals via the nanoscale Kirkendall effect for supercapacitors**

Yongfu Tang,* Teng Chen, Shengxue Yu, Yuqing Qiao, Shichun Mu, Jie Hu and Faming Gao

Graphene oxide (GO) anchored porous manganese sulfide nanocrystals (MnS/GO-NH₃) were obtained via a facile hydrothermal method based on the Kirkendall effect.

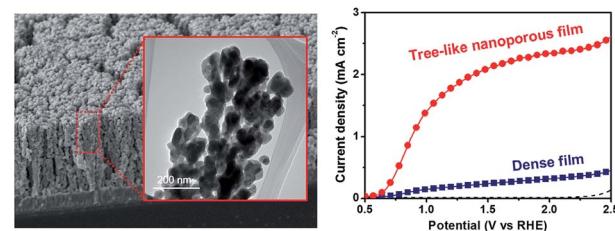
PAPERS

12920

A tree-like nanoporous WO_3 photoanode with enhanced charge transport efficiency for photoelectrochemical water oxidation

Sun Shin, Hyun Soo Han, Ju Seong Kim, Ik Jae Park, Myeong Hwan Lee, Kug Sun Hong and In Sun Cho*

A tree-like nanoporous tungsten trioxide (WO_3) photoanode that largely improves the photoelectrochemical water-oxidation performance was synthesized by a laser ablation method.

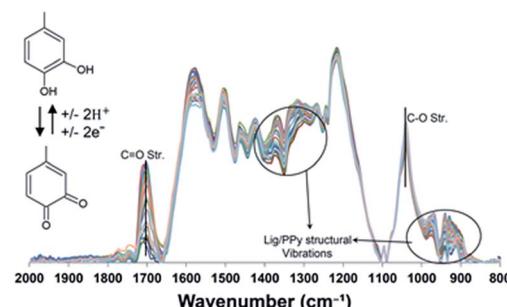


12927

Spectroelectrochemical investigation of redox states in a polypyrrole/lignin composite electrode material

F. N. Ajjan, M. J. Jafari, T. Rębiś, T. Ederth and O. Inganäs*

Spectroelectrochemical investigation of redox states in a polypyrrole/lignin composite electrode material.

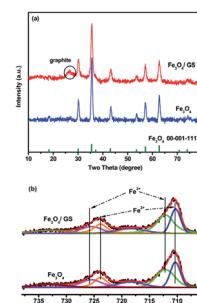


12938

Graphene oxide sheets-induced growth of nanostructured Fe_3O_4 for a high-performance anode material of lithium ion batteries

Xiangfei Meng, Youlong Xu,* Xiaofei Sun, Jie Wang, Lilong Xiong, Xianfeng Du and Shengchun Mao

Nanostructured Fe_3O_4 is intrinsically prone to aggregation, which hinders insertion and extraction of lithium ions.

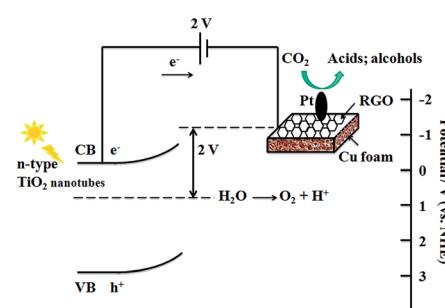


12947

A Cu foam cathode used as a Pt–RGO catalyst matrix to improve CO_2 reduction in a photoelectrocatalytic cell with a TiO_2 photoanode

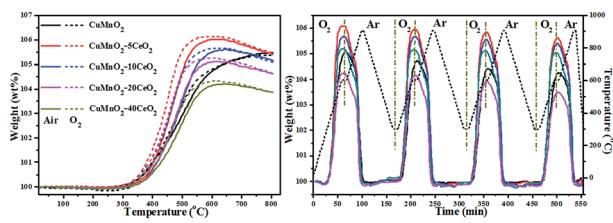
Jun Cheng,* Meng Zhang, Jianzhong Liu, Junhu Zhou and Kefa Cen

A Cu foam cathode was used as a Pt–RGO catalyst matrix for CO_2 reduction in a photoelectrocatalytic cell with a TiO_2 nanotube photoanode.



PAPERS

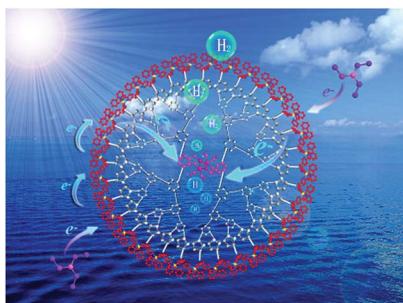
12958

**Oxygen storage capacity and thermal stability of the CuMnO₂–CeO₂ composite system**

Xiubing Huang, Chengsheng Ni, Guixia Zhao and John T. S. Irvine*

Fast oxygen diffusion and improved oxygen storage capacity of crednerite CuMnO₂ have been achieved at reduced temperatures by surface modification with CeO₂.

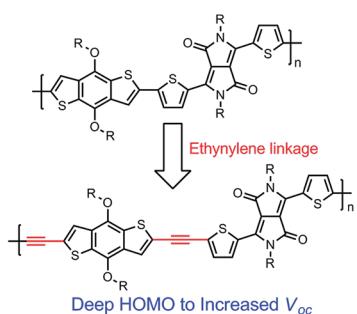
12965

**Artificial photosynthesis dendrimers integrating light-harvesting, electron delivery and hydrogen production**

Zhiqing Xun, Tianjun Yu, Yi Zeng,* Jinping Chen, Xiaohui Zhang, Guoqiang Yang* and Yi Li*

Artificial photosynthesis dendrimers, which integrate light-harvesting, electron delivery and hydrogen production, were constructed and have demonstrated improved photocatalytic activity due to the dendritic architecture.

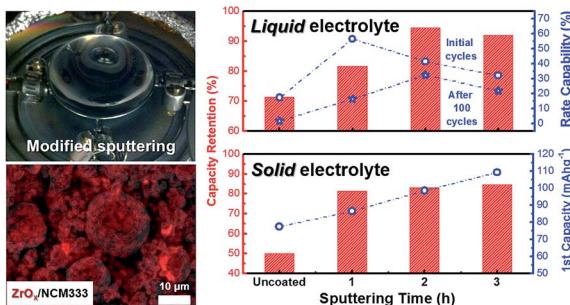
12972

**Ethyne-linked benzo[1,2-*b*:4,5-*b'*]dithiophene-*alt*-diketopyrrolopyrrole alternating copolymer: optoelectronic properties, film morphology and photovoltaic applications**

Hongyu Wang,* Yimin Ding, Yanbang Lai, Zhiwei Sun, Yao Liu, Bin Jiang, Ming Chen, Jian Yao, Feng Liu* and Thomas P. Russell*

An ethynylene-linked copolymer was synthesized for increasing the V_{oc} of organic solar cells. And a high V_{oc} of 0.88 V was achieved due to the low-lying HOMO level.

12982

**The effect of energetically coated ZrO_x on enhanced electrochemical performances of Li(Ni_{1/3}Co_{1/3}Mn_{1/3})O₂ cathodes using modified radio frequency (RF) sputtering**

Ji-Hoon Lee, Ji Woo Kim, Ho-Young Kang, Seul Cham Kim, Sang Sub Han, Kyu Hwan Oh, Se-Hee Lee* and Young-Chang Joo*

By introducing the ZrO_x layer coated using a novel sputtering, the electrochemical performance of Li(Ni_{1/3}Co_{1/3}Mn_{1/3})O₂ under liquid and solid electrolyte was greatly improved.

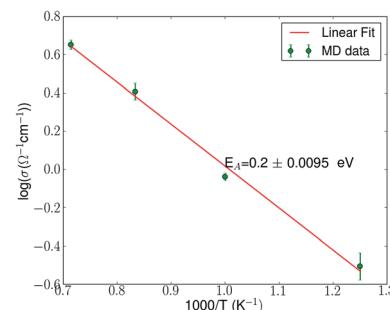
PAPERS

12992

Theoretical prediction of a highly conducting solid electrolyte for sodium batteries: Na₁₀GeP₂S₁₂

Vinay S. Kandagal,* Mridula Dixit Bharadwaj and Umesh V. Waghmare

The theoretically predicted compound Na₁₀GeP₂S₁₂ exhibits Na-ionic conductivity of the same order of magnitude as that of other state-of-the-art solid electrolytes used in practical sodium batteries such as high-temperature sodium–sulfur batteries.

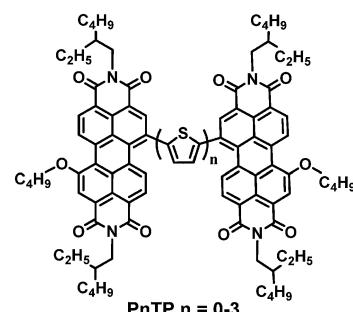


13000

Oligothiophene-bridged perylene diimide dimers for fullerene-free polymer solar cells: effect of bridge length

Jiayu Wang, Yuehan Yao, Shuixing Dai, Xinpeng Zhang, Wei Wang, Qiao He, Lei Han, Yuze Lin* and Xiaowei Zhan*

A series of PDI dimers with oligothiophenes as bridges were designed, theoretically calculated, synthesized, and developed as electron acceptors for polymer solar cells. The effects of oligothiophene bridge length were investigated.

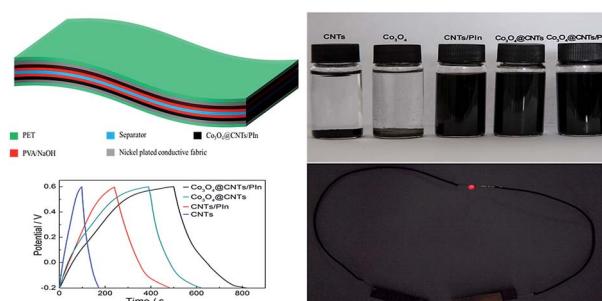


13011

Facile synthesis of a Co₃O₄@carbon nanotubes/polyindole composite and its application in all-solid-state flexible supercapacitors

Xi Zhou, Anqi Wang, Yumei Pan, Chenfei Yu, Yun Zou, Yang Zhou, Qiang Chen* and Shishan Wu*

An all-solid-state flexible supercapacitor that achieves a high specific capacitance of 442.5 F g⁻¹ was facilely synthesized based on a Co₃O₄@carbon nanotubes/polyindole composite.

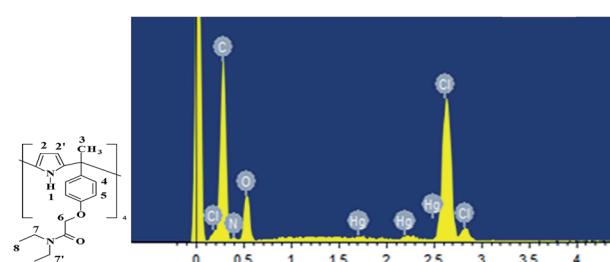


13016

A ditopic calix[4]pyrrole amide derivative: highlighting the importance of fundamental studies and the use of NaPh₄B as additive in the design and applications of mercury(II) ion selective electrodes

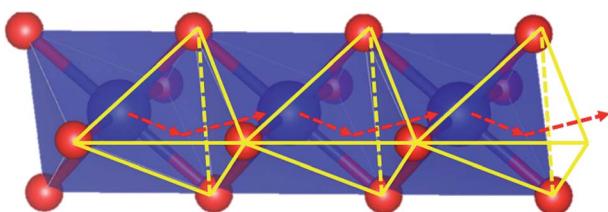
Angela F. Danil de Namor,* Abdelaziz El Gamouz, Salman Alharthi, Nawal Al Hakawati and John R. Varcoe

A ditopic calix[4]pyrrole amide based ion selective electrode and its applications are first reported. Sodium tetraphenylboron currently used as additive in Hg ISE is by itself a sensor for mercury(II).



PAPERS

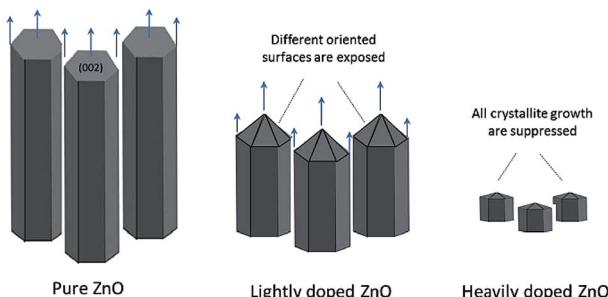
13031

**The migration mechanism of transition metal ions in $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$**

Gui-Liang Xu, Yan Qin, Yang Ren, Lu Cai, Ke An, Khalil Amine and Zonghai Chen*

In situ high-energy X-ray diffraction and neutron diffraction were deployed to trace the migration of transition metal ions in $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$.

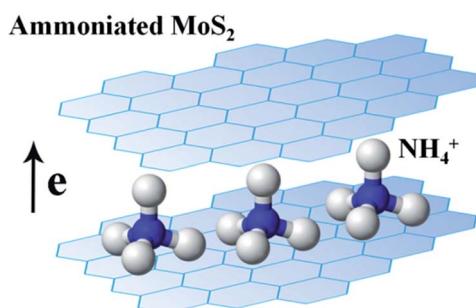
13039

**Aerosol assisted chemical vapour deposition of Ga-doped ZnO films for energy efficient glazing: effects of doping concentration on the film growth behaviour and opto-electronic properties**

Shuqun Chen, Giorgio Carraro, Davide Barreca, Andrei Sapekin, Wenzhi Chen, Xuan Huang, Qijin Cheng, Fengyan Zhang and Russell Binions*

AACVD ZnO film growth as a function of doping concentration.

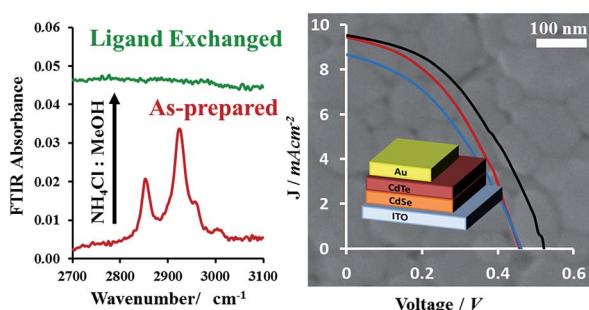
13050

**Enhanced hydrogen evolution catalysis from osmotically swollen ammoniated MoS_2**

Zhuangzhi Wu, Chaoyun Tang, Pan Zhou, Zhihong Liu, Yushuai Xu, Dezhi Wang* and Baizeng Fang*

Osmotically swollen ammoniated MoS_2 was obtained via a facile hydrothermal route, exhibiting excellent HER performances due to its improved electrical conductivity.

13057

**Safer salts for CdTe nanocrystal solution processed solar cells: the dual roles of ligand exchange and grain growth**

Troy K. Townsend,* William B. Heuer, Edward E. Foos, Eric Kowalski, Woojun Yoon and Joseph G. Tischler

The dual role of salt treatment was revealed by replacing conventional CdCl_2 with non-toxic NH_4Cl to simultaneously exchange native ligands and promote grain growth in inorganic CdTe nanocrystal solar cells.

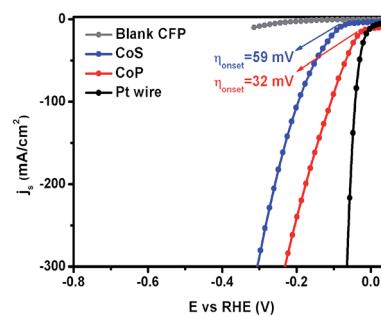
PAPERS

13066

Facile synthesis of CoX (X = S, P) as an efficient electrocatalyst for hydrogen evolution reaction

Jiayuan Li, Xuemei Zhou, Zhaoming Xia, Zhiyun Zhang, Jing Li, Yuanyuan Ma* and Yongquan Qu*

HER catalytic activity of CoX (X = S, P) nanocatalysts prepared through a facile and controllable synthesis by the chemical conversion of thin Co(OH)₂ nanoplates was studied. The better HER performance of CoP could be derived from its intrinsically positive charged nature of the metal center Co, the long bond length of Co–P and the abundant catalytic active sites toward HER.

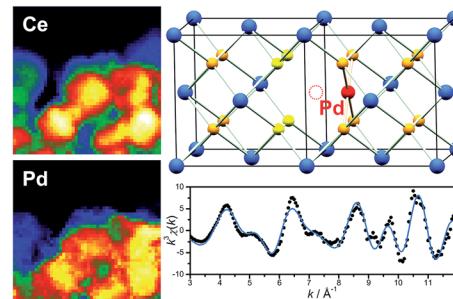


13072

Incorporation of square-planar Pd²⁺ in fluorite CeO₂: hydrothermal preparation, local structure, redox properties and stability

Craig I. Hiley, Janet M. Fisher, David Thompsett, Reza J. Kashtiban, Jeremy Sloan and Richard I. Walton*

EXAFS shows that square-planar Pd²⁺ can be accommodated in CeO₂ in interstitial positions to give Ce_{1-x}Pd_xO_{2-δ} ($x \leq 0.15$); redox properties and stability have been explored.

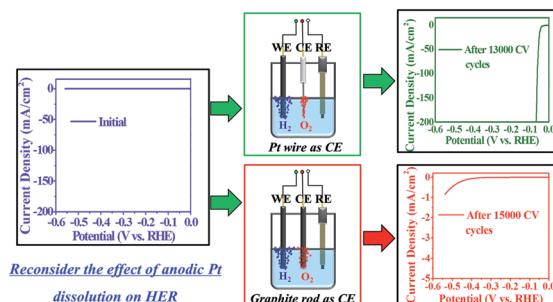


13080

Insight into the electrochemical activation of carbon-based cathodes for hydrogen evolution reaction

Guofa Dong, Ming Fang, Hongtao Wang, Senpo Yip, Ho-Yuen Cheung, Fengyun Wang, Chun-Yuen Wong, Sai Tak Chu* and Johnny C. Ho*

The anodic Pt dissolution, although widely ignored, should be taken into consideration during electrochemical tests when Pt metal is utilized as the counter electrode.



Reconsider the effect of anodic Pt dissolution on HER

13087

Carbon nanotubes decorated with nickel phosphide nanoparticles as efficient nanohybrid electrocatalysts for the hydrogen evolution reaction

Yuan Pan, Wenhui Hu, Dapeng Liu, Yunqi Liu* and Chenguang Liu*

Nickel phosphide nanoparticles decorated on carbon nanotubes were synthesized by *in situ* thermal decomposition for the first time. The Ni₂P/CNT nanohybrid exhibits high activity and stability for hydrogen evolution.

