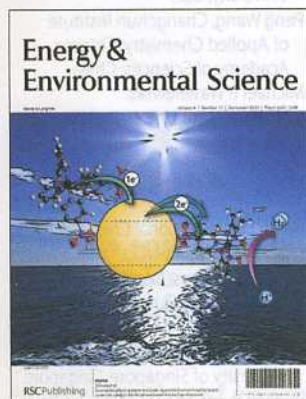


IN THIS ISSUE

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Cover
See Durrant *et al.*, pp. 3291–3300.
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Inside cover
See Jo *et al.*, pp. 3301–3307.
Image reproduced by permission of Won Ho Jo from *Energy Environ. Sci.*, 2013, **6**, 3301.

REVIEWS

3112

Status and perspectives of CO₂ conversion into fuels and chemicals by catalytic, photocatalytic and electrocatalytic processes

Evgenii V. Kondratenko,* Guido Mul, Jonas Baltusaitis, Gastón O. Larrazábal and Javier Pérez-Ramírez*

Recent progress and future perspectives in CO₂ utilization for the production of energy carriers and commodity chemicals are discussed.

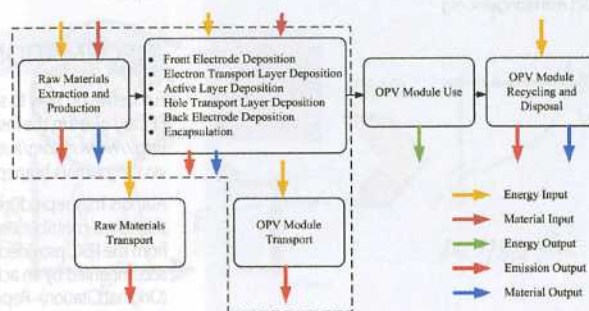


3136

Life cycle analyses of organic photovoltaics: a review

Sebastien Lizin,* Steven Van Passel, Ellen De Schepper, Wouter Maes, Laurence Lutsen, Jean Manca and Dirk Vanderzande

This paper reviews the available life cycle analysis (LCA) literature on organic photovoltaics (OPVs).

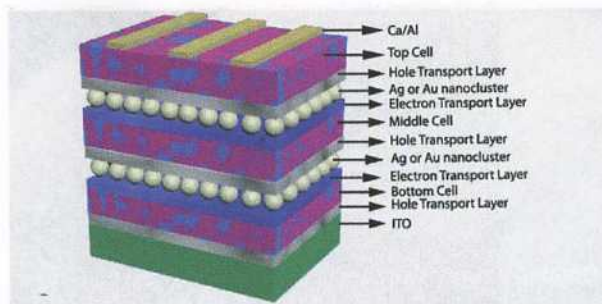


3150

Triple junction polymer solar cells

Olusegun Adebajo, Purna P. Maharjan, Prajwal Adhikary, Mingtai Wang, Shangfeng Yang and Qiquan Qiao*

Similar to single and double junction polymer solar cells, triple junction devices can also be fabricated from all-solution processing.



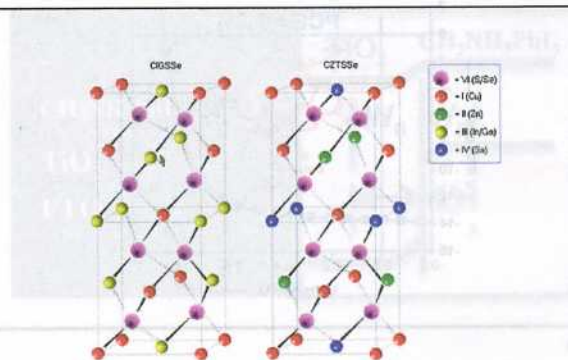
PERSPECTIVES

3171

The state and future prospects of kesterite photovoltaics

Alex Polizzotti,* Ingrid L. Repins, Rommel Noufi, Su-Huai Wei and David B. Mitzi

A recent meeting of experts in kesterite and related photovoltaic materials yielded recommendations to accelerate this technology towards commercial-ready modules. This paper summarizes these conclusions while providing background on relevant areas.

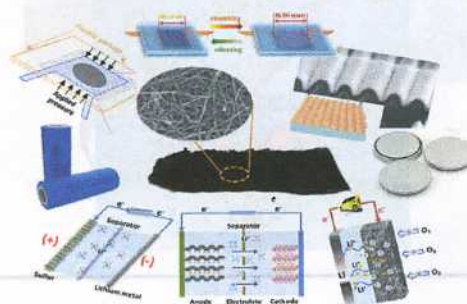


3183

A perspective: carbon nanotube macro-films for energy storage

Zeyuan Cao and Bingqing (B. Q.) Wei*

2-D CNT macro-films and their applications for various energy storage devices including supercapacitors and lithium-ion batteries are discussed.

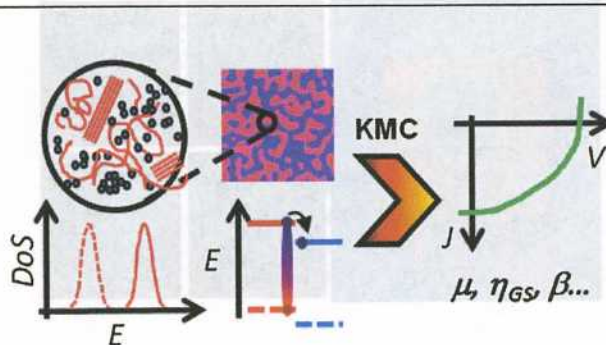


3202

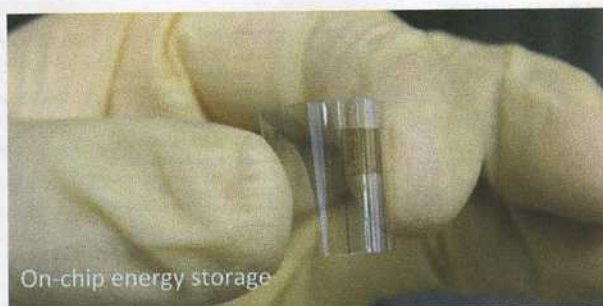
Developing understanding of organic photovoltaic devices: kinetic Monte Carlo models of geminate and non-geminate recombination, charge transport and charge extraction

Chris Groves

This Perspective discusses how kinetic Monte Carlo models can be used to better understand the operation of organic photovoltaic devices.



3218

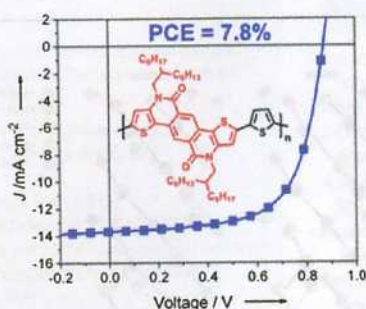


On chip, all solid-state and flexible micro-supercapacitors with high performance based on MnO_x/Au multilayers

Wenping Si, Chenglin Yan,* Yao Chen, Steffen Oswald, Luyang Han and Oliver G. Schmidt

A new concept was introduced to fabricate on chip, all solid-state and flexible micro-supercapacitors based on MnO_x/Au multilayers.

3224

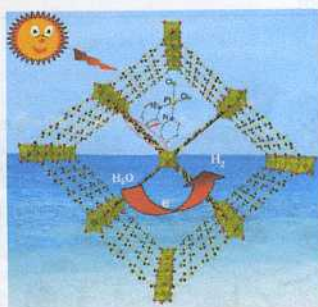


A pentacyclic aromatic lactam building block for efficient polymer solar cells

Jiamin Cao, Qiaogan Liao, Xiaoyan Du, Jianhua Chen, Zuo Xiao,* Qiqun Zuo and Liming Ding*

A D–A conjugated polymer (PThTPTI) was developed by using a brand new pentacyclic aromatic lactam acceptor unit (TPTI). The polymer demonstrates an outstanding PCE of 7.8%.

3229

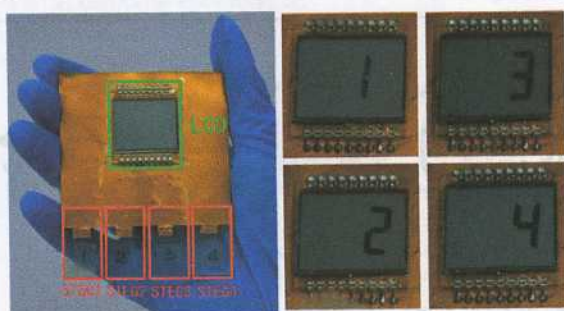


Post-synthesis modification of a metal–organic framework to construct a bifunctional photocatalyst for hydrogen production

Tianhua Zhou, Yonghua Du, Armando Borgna, Jindui Hong, Yabo Wang, Jianyu Han, Wei Zhang and Rong Xu*

A bifunctional photocatalyst MOF-253-Pt was constructed by post-synthetic modification. It serves both as photosensitizer and catalyst for visible-light photocatalytic H_2 evolution from water.

3235



A transparent single-friction-surface triboelectric generator and self-powered touch sensor

Bo Meng, Wei Tang, Zhi-han Too, Xiaosheng Zhang, Mengdi Han, Wen Liu and Haixia Zhang*

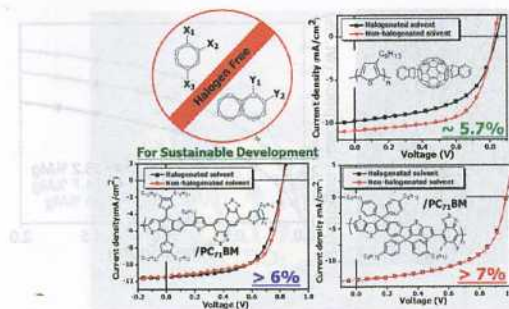
The self-powered touch sensor using 4 single-friction-surface triboelectric generators as touch pads indicates which pad was touched on an LCD.

3241

Non-halogenated solvents for environmentally friendly processing of high-performance bulk-heterojunction polymer solar cells

Chu-Chen Chueh, Kai Yao, Hin-Lap Yip, Chih-Yu Chang, Yun-Xiang Xu, Kung-Shih Chen, Chang-Zhi Li, Peng Liu, Fei Huang, Yiwang Chen, Wen-Chang Chen and Alex K.-Y. Jen*

High-performance bulk-heterojunction polymer solar cells processed from environmentally friendly non-halogenated solvents.

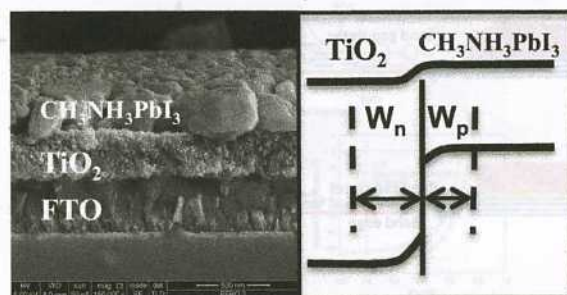


3249

Depleted hole conductor-free lead halide iodide heterojunction solar cells

Waleed Abu Laban and Lioz Etgar*

High efficiency hole conductor free $\text{CH}_3\text{NH}_3\text{PbI}_3$ heterojunction solar cells show a depletion region, which extends to both n and p sides.

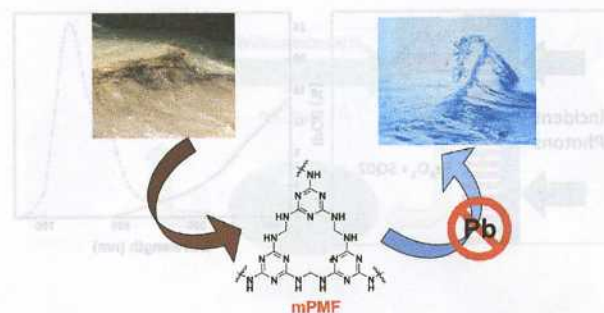


3254

A mesoporous poly-melamine-formaldehyde polymer as a solid sorbent for toxic metal removal

Mei Xuan Tan, Yin Ngai Sum, Jackie Y. Ying* and Yugen Zhang*

A mesoporous poly-melamine-formaldehyde polymer was highly effective in removing lead ions from water to the ppt level within seconds.

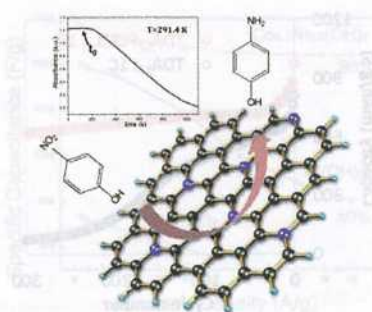


3260

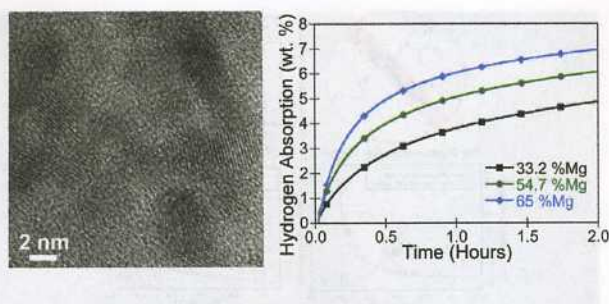
Metal-free catalytic reduction of 4-nitrophenol to 4-aminophenol by N-doped graphene

Xiang-kai Kong, Zhi-yuan Sun, Min Chen, Chang-le Chen* and Qian-wang Chen*

N-Doped graphene was found to catalyse the reduction of 4-nitrophenol to 4-aminophenol, under mild conditions with high activity.



3267

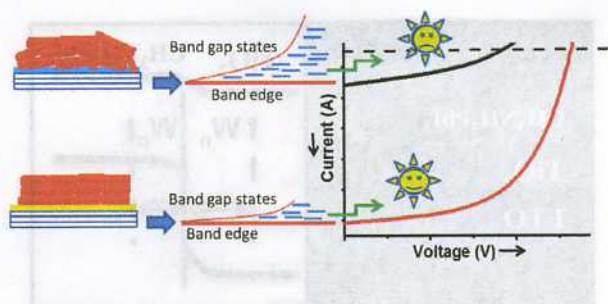


Synergistic enhancement of hydrogen storage and air stability via Mg nanocrystal-polymer interfacial interactions

Anne M. Ruminski, Rizia Bardhan, Alyssa Brand, Shaul Aloni and Jeffrey J. Urban*

Amelioration of material properties of functional nanocomposites is achieved through tailored nanoparticle-polymer interactions.

3272

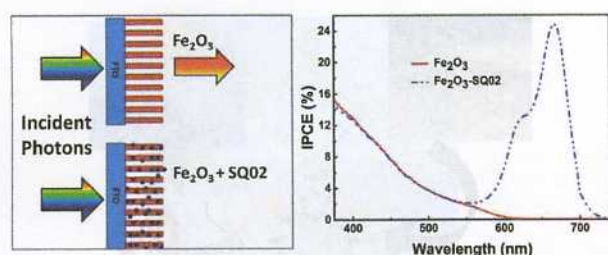


The effect of structural order on solar cell parameters, as illustrated in a SiC-organic junction model

Pabitra K. Nayak, Lee Barnea-Nehoshtan, R. Soyoung Kim, Andrew Shu, Gabriel Man, Antoine Kahn, David Lederman, Yishay Feldman and David Cahen*

To understand the title topic a model system of single crystal SiC, modified with an interfacial molecular monolayer of alkyl siloxane molecules, with polycrystalline pentacene deposited on it, was fabricated.

3280

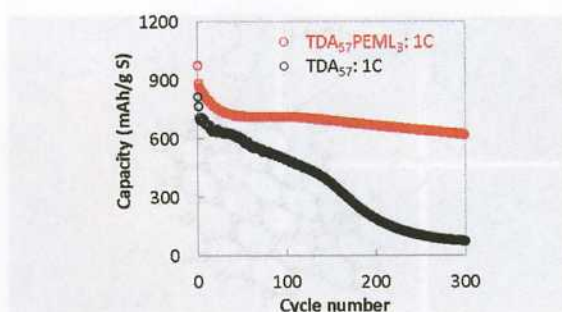


Decoupling light absorption and charge transport properties in near IR-sensitized Fe₂O₃ regenerative cells

Mulmudi Hemant Kumar, Nripan Mathews,* Pablo P. Boix, Kazuteru Nonomura, Satvasheel Powar, Lam Yeng Ming,* Michael Graetzel and Subodh G. Mhaisalkar

The complementary absorption properties of Fe₂O₃ and SQ02 dye were used to study the charge transport properties in Fe₂O₃.

3286



Ultrathin tunable ion conducting nanomembranes for encapsulation of sulfur cathodes

Claudiu B. Bucur, John Muldoon,* Adrian Lita, Joseph B. Schlenoff, Ramy A. Ghostine, Steve Dietz and Gary Allred

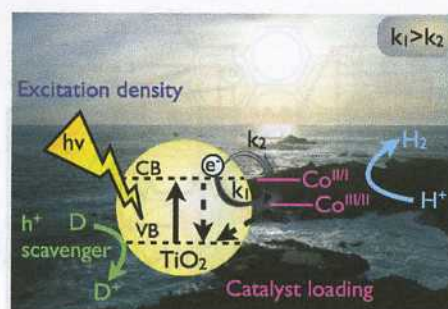
Polyelectrolyte multilayer (PEML) nano-membranes impede polysulfide dissolution, therefore enhancing the performance of carbon sulfur composite cathodes.

3291

Parameters affecting electron transfer dynamics from semiconductors to molecular catalysts for the photochemical reduction of protons

Anna Reynal, Fezile Lakadamyali, Manuela A. Gross, Erwin Reisner and James R. Durrant*

Measurements of the two-electron transfer kinetics from TiO_2 to a molecular catalyst for proton reduction.

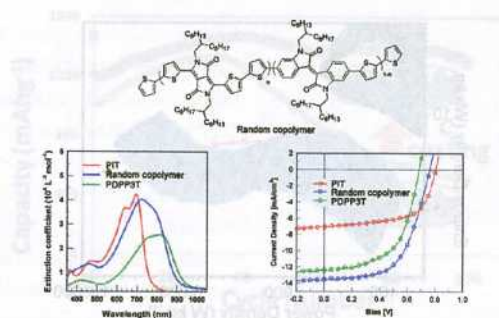


3301

Semi-crystalline random conjugated copolymers with panchromatic absorption for highly efficient polymer solar cells

Jae Woong Jung, Feng Liu, Thomas P. Russell and Won Ho Jo*

A semi-crystalline random copolymer which exhibits both a broad light absorption and low-lying HOMO level shows a power conversion efficiency over 6%.

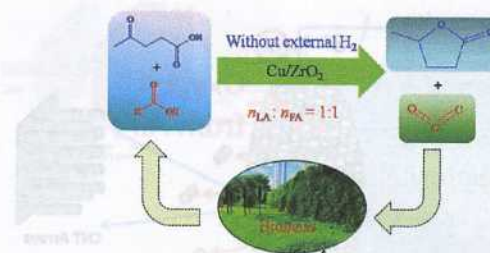


3308

Copper-based catalysts for the efficient conversion of carbohydrate biomass into γ -valerolactone in the absence of externally added hydrogen

Jing Yuan, Shu-Shuang Li, Lei Yu, Yong-Mei Liu, Yong Cao,* He-Yong He and Kang-Nian Fan

Using earth-abundant and inexpensive copper as a catalyst and the equivalent formic acid (FA) as the sole hydrogen source, levulinic acid (LA) can be facilely reduced to γ -valerolactone (GVL), a very interesting green, bio-based compound with high application potential.

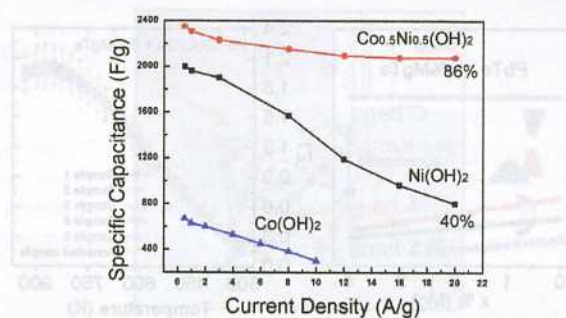


3314

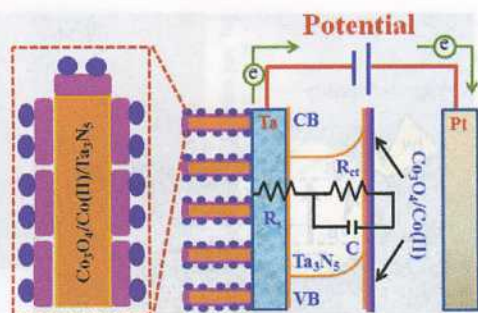
Improving the performance of cobalt-nickel hydroxide-based self-supporting electrodes for supercapacitors using accumulative approaches

Yingwen Cheng, Hongbo Zhang, Chakrapani V. Varanasi and Jie Liu*

An accumulative approach is developed for fabricating supercapacitor electrodes with ultrahigh energy and power performance.



3322

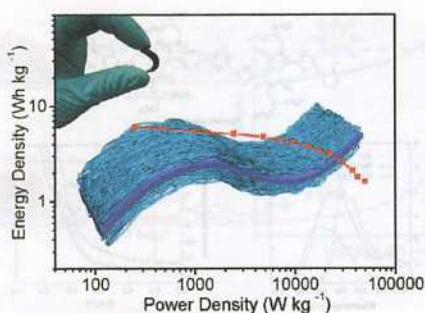


Cobalt-bilayer catalyst decorated Ta_3N_5 nanorod arrays as integrated electrodes for photoelectrochemical water oxidation

Jungang Hou, Zheng Wang, Chao Yang, Huijie Cheng, Shuqiang Jiao* and Hongmin Zhu*

The cobalt-bilayer catalyst decorated Ta_3N_5 nanorod array as integrated electrodes exhibit that not only the onset potential is negatively shifted but also the photocurrent and the stability are significantly improved.

3331

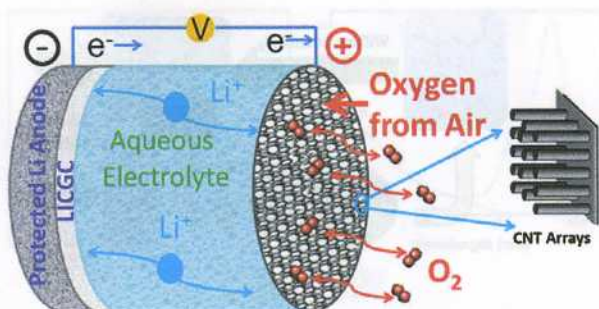


Flexible all-solid-state high-power supercapacitor fabricated with nitrogen-doped carbon nanofiber electrode material derived from bacterial cellulose

Li-Feng Chen, Zhi-Hong Huang, Hai-Wei Liang, Wei-Tang Yao, Zi-You Yu and Shu-Hong Yu*

A new kind of all-solid-state flexible supercapacitor has been fabricated with electrode materials of nitrogen-doped pyrolyzed bacterial cellulose *via* a low-cost, eco-friendly, and scalable hydrothermal approach. This device exhibits good supercapacitive performance with a high power capacity.

3339

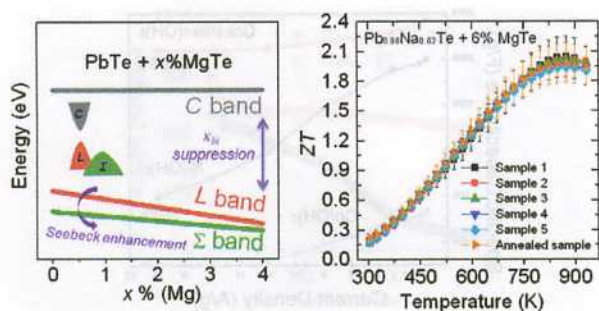


Hybrid Li-air battery cathodes with sparse carbon nanotube arrays directly grown on carbon fiber papers

Yunfeng Li, Zhongping Huang, Kan Huang, David Carnahan and Yangchuan Xing*

A hierarchically structured cathode consisting of nitrogen doped CNT arrays (CNTAs) directly grown on a backing carbon paper is demonstrated to have many advantages in rechargeable hybrid Li-air batteries.

3346



All-scale hierarchical thermoelectrics: MgTe in PbTe facilitates valence band convergence and suppresses bipolar thermal transport for high performance

L. D. Zhao, H. J. Wu, S. Q. Hao, C. I. Wu, X. Y. Zhou, K. Biswas, J. Q. He,* T. P. Hogan, C. Uher, C. Wolverton, V. P. Dravid and M. G. Kanatzidis*

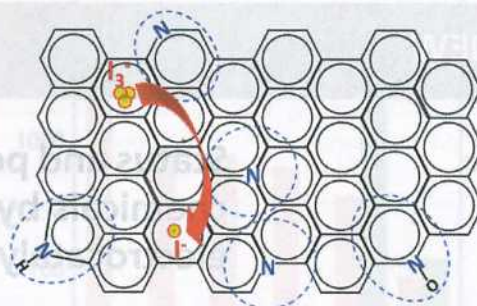
Multi-functions of MgTe, including increasing Seebeck coefficients, suppressing bipolar thermal conductivity and reducing lattice thermal conductivity, push 2% Na-doped PbTe to achieve high thermoelectric performance, ZT of 2.0 at 823 K.

3356

Nitrogen-doped graphene for dye-sensitized solar cells and the role of nitrogen states in triiodide reduction

Shaocong Hou, Xin Cai, Hongwei Wu, Xiao Yu, Ming Peng, Kai Yan and Dechun Zou*

Nitrogen-doped graphene was demonstrated as an efficient Pt-free electrocatalyst for dye-sensitized solar cells, and its catalytic active sites were systematically explored.

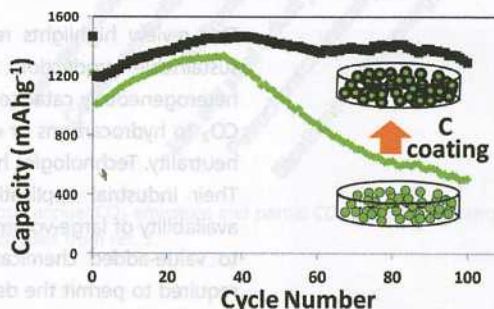


3363

A new room temperature and solvent free carbon coating procedure for battery electrode materials

Alexandre Ponrouch,* Alejandro R. Goñi, Moulay T. Sougrati, Mohamed Ati, Jean-Marie Tarascon, Jessica Nava-Avendaño and M. Rosa Palacín*

A physical deposition procedure for carbon coating on battery active materials at room temperature under dry conditions has been developed, avoiding the limitations of standard chemical procedures and being generally applicable to any electrode active material.

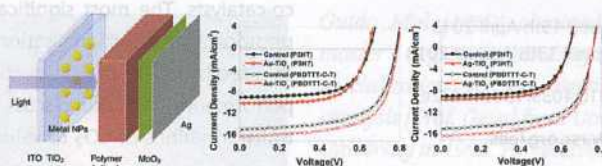


3372

Enhanced charge extraction in organic solar cells through electron accumulation effects induced by metal nanoparticles

Feng-xian Xie, Wallace C. H. Choy,* Wei E. I. Sha, Di Zhang, Shaoqing Zhang, Xinchun Li, Chi-wah Leung and Jianhui Hou

Metal nanoparticles (NPs) have been used to enhance the performance of thin-film devices such as organic photovoltaics through electron accumulation effect.



3380

Facet engineered Ag₃PO₄ for efficient water photooxidation

David James Martin, Naoto Umezawa, Xiaowei Chen, Jinhua Ye and Junwang Tang*

Tetrahedral silver phosphate crystals composed of pure {111} facets photooxidise water over 10 times faster than cubic {100} or rhombic dodecahedral {110} facets; the superb performance (~100% quantum yield at 400 nm and larger than 80% in a wide range of wavelength) is due to the exposed facets, enabling high hole mobility and high surface energy.

