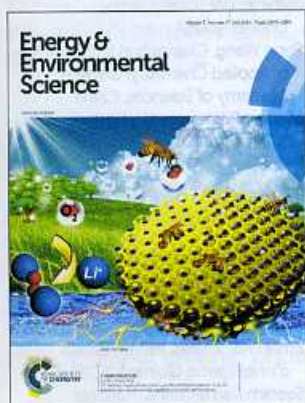


IN THIS ISSUE

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Cover
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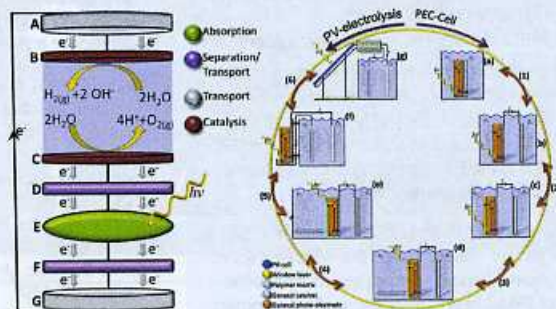
ANALYSIS

2056

Sustainable solar hydrogen production: from photoelectrochemical cells to PV-electrolyzers and back again

T. Jesper Jacobsson,* Viktor Fjällström, Marika Edoff and Tomas Edvinsson

A theoretical analysis of different device concepts for solar hydrogen production, demonstrating the close similarities between photoelectrochemical cells and PV-electrolyzers.



REVIEWS

2071

Functional materials derived from open framework templates/precursors: synthesis and applications

Jian-Ke Sun and Qiang Xu*

This review discusses the open frameworks as templates and/or precursors for the synthesis of porous carbons and other nanostructured functional materials including metal/metal oxide nanoparticles and carbon–metal/metal oxide hybrids. A survey of the research progress in the applications of these materials for gas sorbents, fuel cells, Li(S/O₂)-ion rechargeable batteries, supercapacitors and catalysts is given.



2101

Advances and challenges for flexible energy storage and conversion devices and systems

Lin Li, Zhong Wu, Shuang Yuan and Xin-Bo Zhang*

To meet the rapid development of flexible, portable, and wearable electronic devices, extensive efforts have been devoted to develop matchable energy storage and conversion systems as power sources, such as flexible lithium-ion batteries (LIBs), supercapacitors (SCs), solar cells, fuel cells, etc.

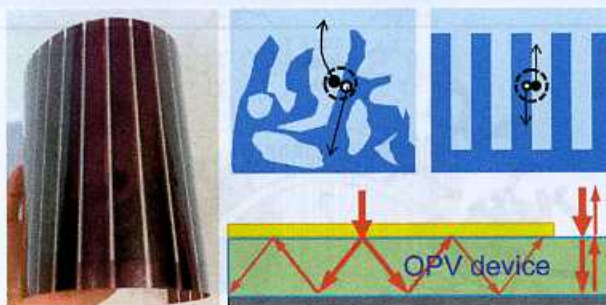


2123

Recent progress in organic photovoltaics: device architecture and optical design

Weiran Cao and Jiangeng Xue*

We review recent advances in device architectures and optical designs for optimizing internal and external efficiencies of organic photovoltaic devices.



2145

Morphology control strategies for solution-processed organic semiconductor thin films

Ying Diao, Leo Shaw, Zhenan Bao* and Stefan C. B. Mannsfeld*

Solution-based deposition techniques and strategies to control the morphology of organic semiconductor thin films are reviewed and discussed.



2160

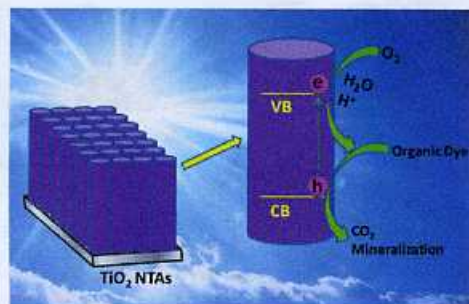
Flexible solid-state supercapacitors: design, fabrication and applications

Xihong Lu, Minghao Yu, Gongming Wang, Yexiang Tong* and Yat Li*

This review highlights the recent progress in the design and fabrication of flexible solid-state supercapacitors.



2182



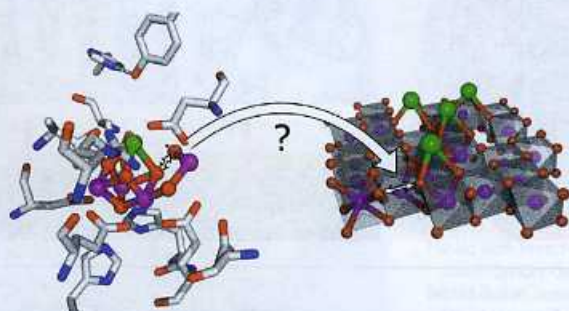
Inorganic-modified semiconductor TiO₂ nanotube arrays for photocatalysis

Mengye Wang, James Iocozia, Lan Sun,* Changjian Lin* and Zhiqun Lin*

This Review highlights the recent developments pertaining to pure and modified TiO₂ nanotube arrays for photocatalysis.

PERSPECTIVE

2203



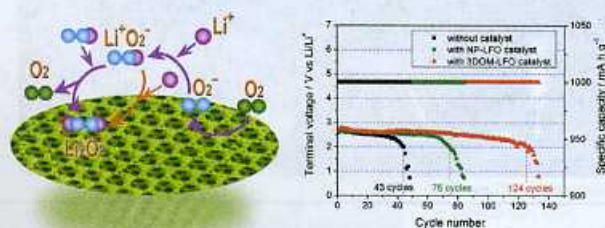
Water oxidation catalysis by manganese oxides: learning from evolution

M. Wiechen, M. M. Najafpour,* S. I. Allakhverdiev and L. Spiccia*

Nature's blueprint for water oxidation catalysis, the oxygen evolving complex of photosystem II, is probably the best understood water oxidation catalyst today. A detailed comparison of this paragon to synthetic Mn oxides reveals a starting point for the rational design of new materials to act as highly efficient water oxidation catalysts.

COMMUNICATIONS

2213

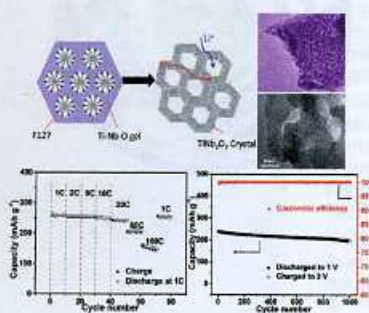


3D ordered macroporous LaFeO₃ as efficient electrocatalyst for Li–O₂ batteries with enhanced rate capability and cyclic performance

Ji-Jing Xu, Zhong-Li Wang, Dan Xu, Fan-Zhi Meng and Xin-Bo Zhang*

3D ordered macroporous LaFeO₃ endows Li–O₂ cell with enhanced specific capacity, rate capacity, and cycling performance.

2220



A long-life lithium-ion battery with a highly porous TiNb₂O₇ anode for large-scale electrical energy storage

Bingkun Guo,* Xiqian Yu, Xiao-Guang Sun, Miaofang Chi, Zhen-An Qiao, Jue Liu, Yong-Sheng Hu,* Xiao-Qing Yang, John B. Goodenough and Sheng Dai*

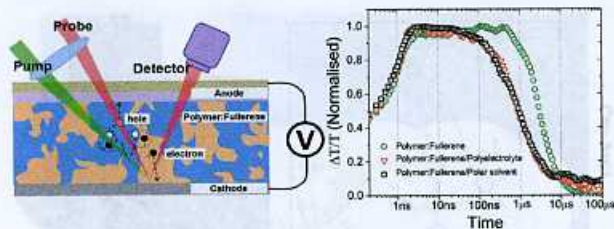
A TiNb₂O₇ material with a nanoporous structure was prepared by a facile approach and can be used as an anode with excellent rate and cycling performance for long-life stationary lithium-ion batteries.

2227

Interface limited charge extraction and recombination in organic photovoltaics

Abhishek Kumar, Girish Lakhwani, Einat Elmaleh, Wilhelm T. S. Huck, Akshay Rao, Neil C. Greenham and Richard H. Friend*

The photogenerated charges in bulk-heterojunction organic PV diode leaves the device up to 4 times faster after improving the semiconductor–electrode interface.

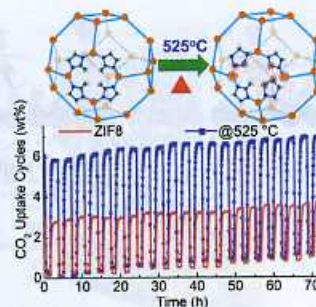


2232

A thermally derived and optimized structure from ZIF-8 with giant enhancement in CO₂ uptake

Srinivas Gadipelli,* Will Travis, Wei Zhou and Zhengxiao Guo*

Post-synthesis thermal annealing of ZIF-8 close to its framework decomposition temperature below 550 °C results in a modified structure with highly enhanced and stable cyclic CO₂ adsorption capacity of over 1.5 mmol g⁻¹ at 25 °C and 1 bar of CO₂, which is over 100% greater than that of initial ZIF-8.

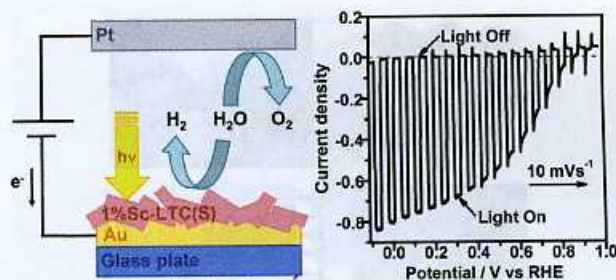


2239

Improving the photoelectrochemical activity of La₅Ti₂CuS₅O₇ for hydrogen evolution by particle transfer and doping

Jingyuan Liu, Takashi Hisatomi, Guijun Ma, Aki Iwanaga, Tsutomu Minegishi, Yosuke Moriya, Masao Katayama, Jun Kubota and Kazunari Domen*

p-Type doped La₅Ti₂CuS₅O₇ photoelectrodes fabricated by particle transfer generate photocathodic current at +0.88 V vs. RHE in photoelectrochemical water splitting.

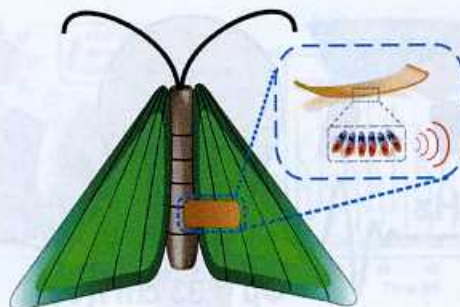


2243

Wireless biomechanical power harvesting via flexible magnetostrictive ribbons

Huai-An Chin, Tian Liang, Shiyu Xu, Gerald R. Poirier, Nan Yao, Sigurd Wagner and Michael C. McAlpine*

Wireless biomechanical power harvesting was realized by printing magnetostrictive ribbons onto an elastomer, forming a composite which can be interfaced with a biomechanical source, such that periodic sample deformations radiate electromagnetic power.

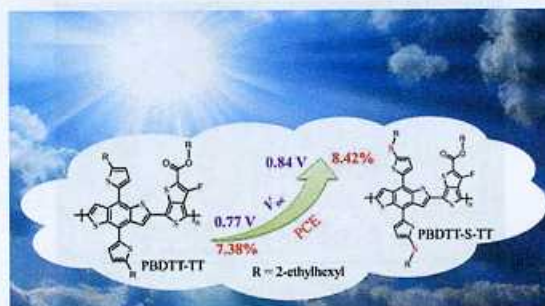


2276

Improvement of open-circuit voltage and photovoltaic properties of 2D-conjugated polymers by alkylthio substitution

Chaohua Cui, Wai-Yeung Wong* and Yongfang Li*

The photovoltaic properties of 2D-conjugated copolymer PBDTTTs were further improved by side chain engineering in a 2D-conjugated polymer.

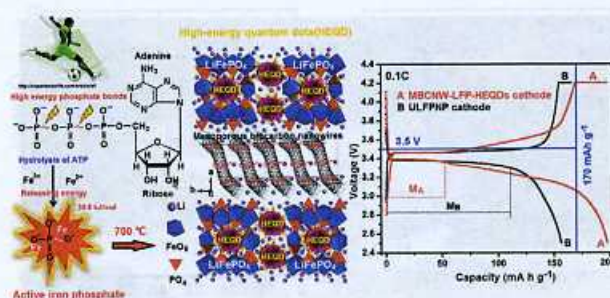


2285

Fabricating high-energy quantum dots in ultra-thin LiFePO₄ nanosheets using a multifunctional high-energy biomolecule—ATP

Xudong Zhang,* Zhiying Bi, Wen He,* Guang Yang, Hong Liu and Yuanzheng Yue*

By using a multifunctional biomolecule—adenosine triphosphate (ATP)—we fabricated high-energy quantum dots in LiFePO₄ nanosheets for high-power lithium-ion batteries.

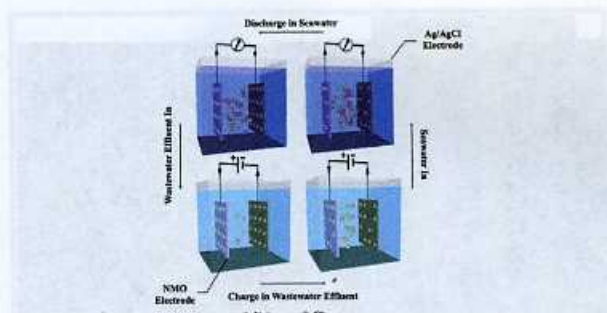


2295

Performance of a mixing entropy battery alternately flushed with wastewater effluent and seawater for recovery of salinity-gradient energy

Meng Ye, Mauro Pasta, Xing Xie, Yi Cui* and Craig S. Criddle*

Salinity-gradient energy can be recovered (68% efficiency) with a mixing entropy battery alternately flushed with wastewater effluent and seawater.

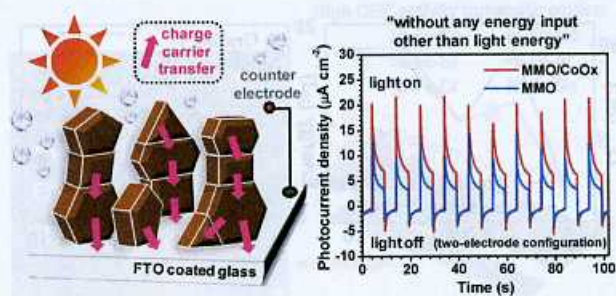


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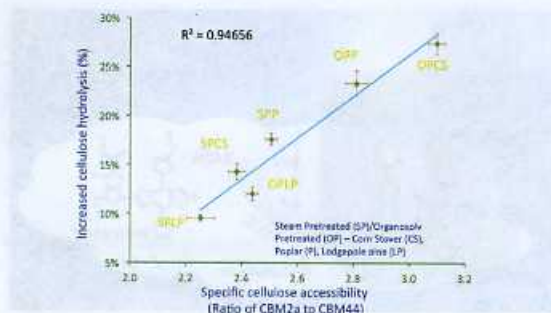
An exceptionally facile method to produce layered double hydroxides on a conducting substrate and their application for solar water splitting without an external bias

Seungho Cho, Ji-Wook Jang, Yoon Bin Park, Jae Young Kim, Ganesan Magesh, Jin Hyun Kim, Minsu Seol, Kijung Yong, Kun-Hong Lee* and Jae Sung Lee*

A photoanode derived from layered double hydroxide is applied for bias-free solar water splitting.



2308

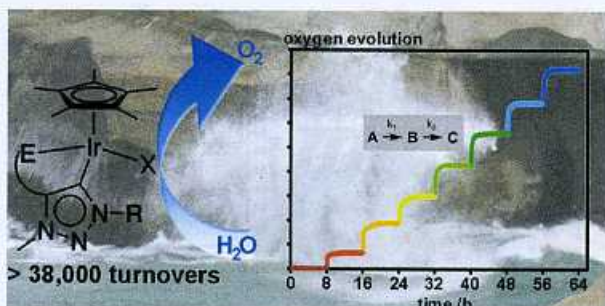


Substrate factors that influence the synergistic interaction of AA9 and cellulases during the enzymatic hydrolysis of biomass

Jinguang Hu, Valdeir Arantes, Amadeus Pribowo, Keith Gourlay and Jack N. Saddler*

Lytic polysaccharide monooxygenases utilise reducing agents within the biomass substrate to act synergistically with canonical hydrolases to enhance cellulose deconstruction.

2316

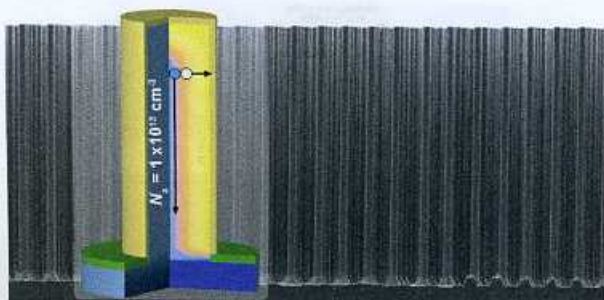


Carbene iridium complexes for efficient water oxidation: scope and mechanistic insights

James A. Woods, Ralte Lalrempuia, Ana Petronilho, Neal D. McDaniel, Helge Müller-Bunz, Martin Albrecht* and Stefan Bernhard*

Combined kinetic & *in operando* spectroscopic studies, factor analysis, and DFT calculations provide insight into the water oxidation reaction catalyzed by operationally homogeneous iridium mesoionic carbene complexes.

2329

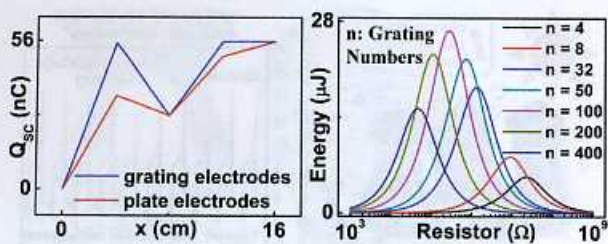


Operation of lightly doped Si microwires under high-level injection conditions

Elizabeth A. Santori, Nicholas C. Strandwitz, Ronald L. Grimm, Bruce S. Brunschwig, Harry A. Atwater* and Nathan S. Lewis*

Lightly doped, structured semiconductors with micron dimensions and high material quality exhibit excellent device performance under high-level injection conditions.

2339



A theoretical study of grating structured triboelectric nanogenerators

Simiao Niu, Sihong Wang, Ying Liu, Yu Sheng Zhou, Long Lin, Youfan Hu, Ken C. Pradel and Zhong Lin Wang*

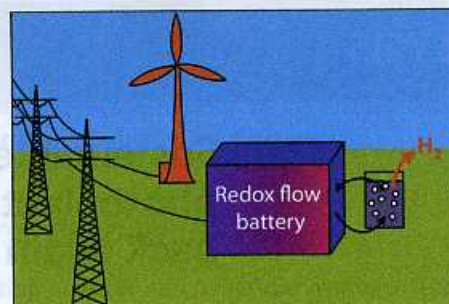
A theoretical model for grating structured triboelectric nanogenerators is provided, which outlines its structural and material optimization strategies.

2350

Renewable hydrogen generation from a dual-circuit redox flow battery

Véronique Amstutz, Kathryn E. Toghil, Francis Powlesland, Heron Vrabel, Christos Comninellis, Xile Hu and Hubert H. Girault*

From junk electricity to hydrogen.

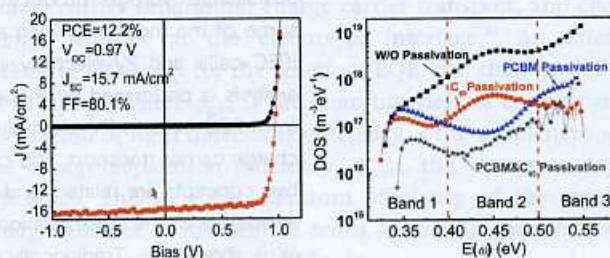


2359

Large fill-factor bilayer iodine perovskite solar cells fabricated by a low-temperature solution-process

Qi Wang, Yuchuan Shao, Qingfeng Dong, Zhengguo Xiao, Yongbo Yuan and Jinsong Huang*

This work studied the influence of the methylammonium iodide/lead iodine precursor ratio on the perovskite film morphology and device performance.

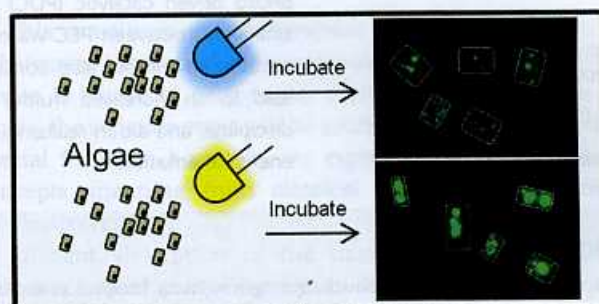


2366

A droplet-based screen for wavelength-dependent lipid production in algae

Steve C. C. Shih, Nooman S. Mufti, M. Dean Chamberlain, Jihye Kim and Aaron R. Wheeler*

A microfluidic screen reveals a wavelength-dependence on lipid accumulation in *Cyclotella cryptica* (with yellow light resulting in more lipids than blue).



2376

A survey of diverse earth abundant oxygen evolution electrocatalysts showing enhanced activity from Ni-Fe oxides containing a third metal

James B. Gerken, Sarah E. Shaner, Robert C. Massé, Nicholas J. Porubsky and Shannon S. Stahl*

Mixed metal oxides containing Ni, Fe, and a third metal constitute a broad family of highly active water oxidation electrocatalysts.

