

IN THIS ISSUE

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Cover
See Lou, Aydil *et al.*,
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See Galli *et al.*,
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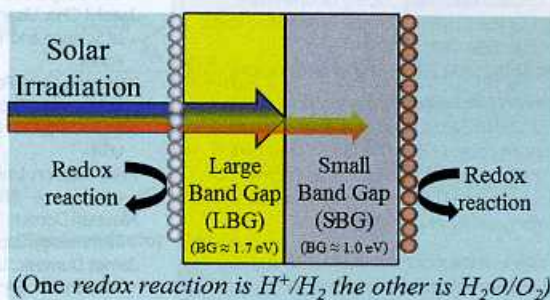
ANALYSIS

2397

2-Photon tandem device for water splitting: comparing photocathode first versus photoanode first designs

Brian Seger, Ivano E. Castelli, Peter C. K. Vesborg,
Karsten W. Jacobsen, Ole Hansen and Ib Chorkendorff*

This work analyzes the differences between a 'photoanode first' and a 'photocathode first' 2-photon water splitting device.



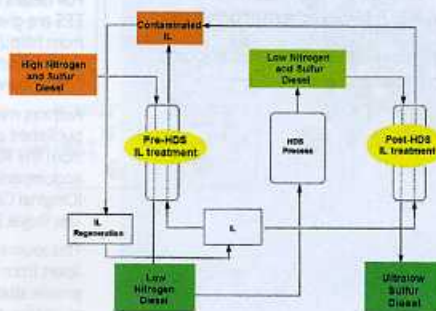
REVIEWS

2414

Applications of ionic liquids in the removal of contaminants from refinery feedstocks: an industrial perspective

Rafael Martínez-Palou* and Rafael Luque

Ionic liquids are novel, green and efficient compounds for the removal of contaminants from refinery feedstocks.

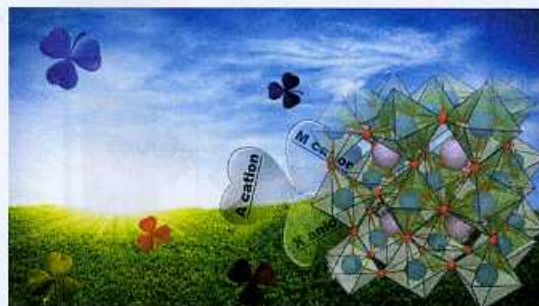


2448

Organohalide lead perovskites for photovoltaic applications

Peng Gao,* Michael Grätzel
and Mohammad K. Nazeeruddin*

This review presents the state-of-the-art organohalide lead perovskites, which are currently making an immense impact across the photovoltaic community.

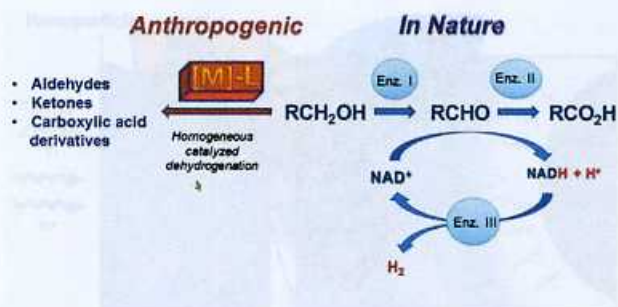


2464

Molecular catalysts for hydrogen production from alcohols

Monica Trincado, Dipshikha Banerjee
and Hansjörg Grützmacher

The conversion of alcohols to carbonyl compounds and hydrogen: a survey of homogeneous enzymatic and anthropogenic catalytic dehydrogenation reactions.

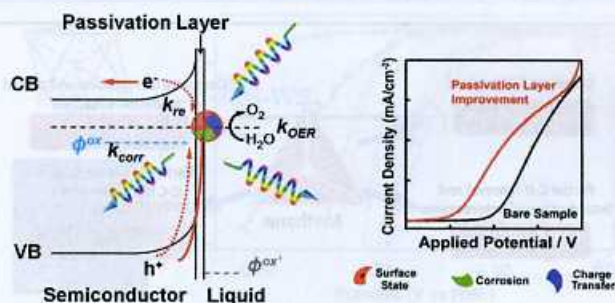


2504

Enhanced photoelectrochemical water-splitting performance of semiconductors by surface passivation layers

Rui Liu, Zhi Zheng, Joshua Spurgeon and Xiaogang Yang*

This review paper summarized recent studies on improving the efficiency of semiconductor-based solar water-splitting devices by introducing surface passivation layers.

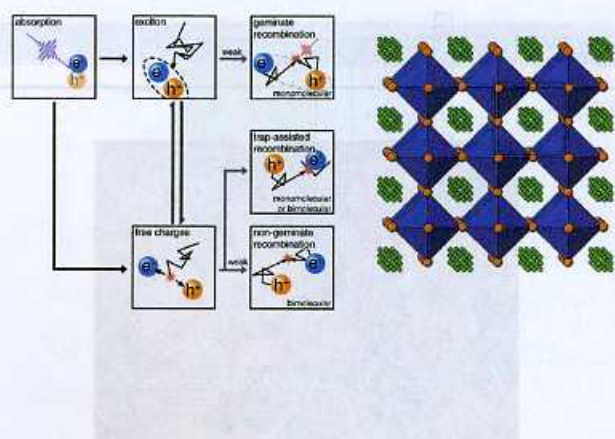


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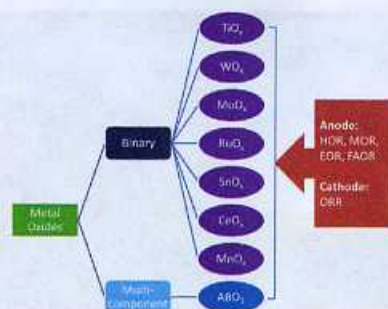
Advancements in perovskite solar cells: photophysics behind the photovoltaics

Tze Chien Sum* and Nripan Mathews*

This article reviews the fundamental photophysics and working mechanisms of perovskite solar cells and highlights the current state-of-the-art and open questions in this maturing field.



2535



An overview of metal oxide materials as electrocatalysts and supports for polymer electrolyte fuel cells

Zhonghua Zhang,* Jie Liu, Junjie Gu, Liang Su and Lifeng Cheng

In this review, we discuss the use of binary and multi-component metal oxides as independent electrocatalysts, co-catalysts and supports for various anode oxidation and cathode reduction reactions in polymer electrolyte fuel cells.

2559



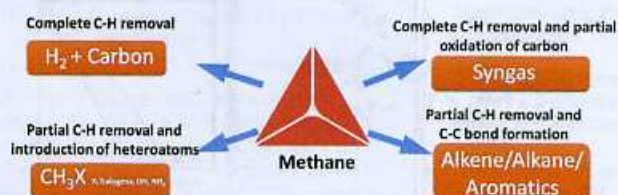
Construction of one-dimensional nanostructures on graphene for efficient energy conversion and storage

Jia Le Xie, Chun Xian Guo and Chang Ming Li*

This review summarizes the recent development of one-dimensional nanostructures constructed on graphene as electrodes have unique physico-chemical properties to synergistically offer highly-efficient energy conversion and storage.

MINIREVIEW

2580



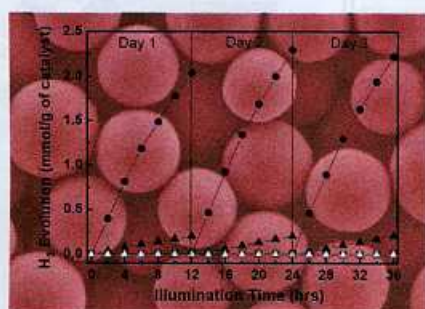
Methane activation: the past and future

Pei Tang, Qingjun Zhu, Zhaoxuan Wu and Ding Ma*

This review summarizes and provides an outlook on the possible routes for methane conversion to valuable fuel and chemicals.

COMMUNICATIONS

2592



Doping high-surface-area mesoporous TiO₂ microspheres with carbonate for visible light hydrogen production

Bin Liu, Li-Min Liu, Xiu-Feng Lang, Hsin-Yi Wang, Xiong Wen (David) Lou* and Eray S. Aydil*

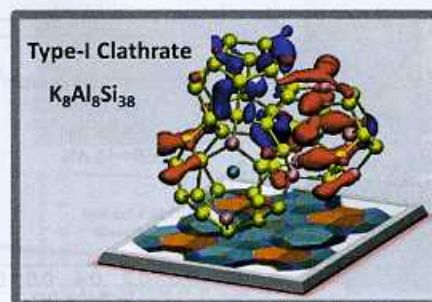
Carbonate-doped mesoporous TiO₂ microspheres exhibit very high photocatalytic activity for visible light hydrogen production and degradation of methyl orange.

2598

Si-based Earth abundant clathrates for solar energy conversion

Yuping He, Fan Sui, Susan M. Kauzlarich and Giulia Galli*

We synthesized a Si-based clathrate, composed entirely of Earth abundant elements, and using *ab initio* calculations and spectroscopic and Hall mobility measurement showed that it is a promising material for solar energy conversion.

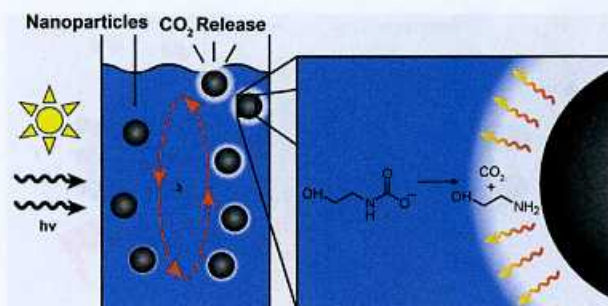


2603

Photothermal release of CO₂ from capture solutions using nanoparticles

Du T. Nguyen, Richard Truong, Richard Lee, Samantha A. Goetz and Aaron P. Esser-Kahn*

We report the use of actinic light for the photo-thermal enhanced regeneration of CO₂ from capture solutions containing nanoparticles. Regeneration efficiency increased with higher nanoparticle concentrations and initial solution temperatures.

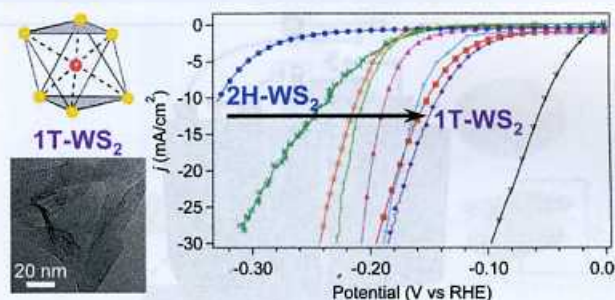


2608

Highly active hydrogen evolution catalysis from metallic WS₂ nanosheets

Mark A. Lukowski, Andrew S. Daniel, Caroline R. English, Fei Meng, Audrey Forticaux, Robert J. Hamers and Song Jin*

Metallic WS₂ nanosheets chemically exfoliated from chemical vapour deposited WS₂ nanostructures display excellent catalytic activity for the hydrogen evolution reaction.

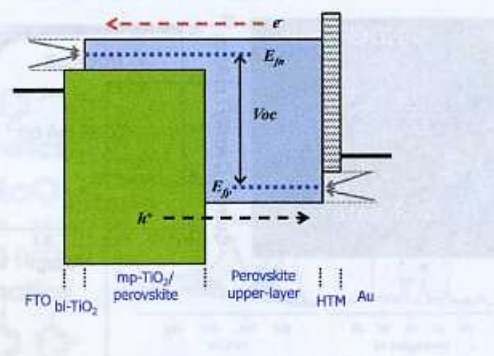


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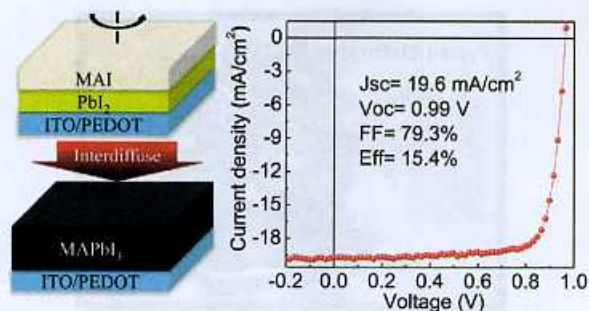
Voltage output of efficient perovskite solar cells with high open-circuit voltage and fill factor

Seungchan Ryu, Jun Hong Noh, Nam Joong Jeon, Young Chan Kim, Woon Seok Yang, Jangwon Seo and Sang Il Seok*

The voltage output of perovskite solar cells is found to be dependent on both the energy level of perovskite itself as a solar absorber and hole transporting materials.



2619

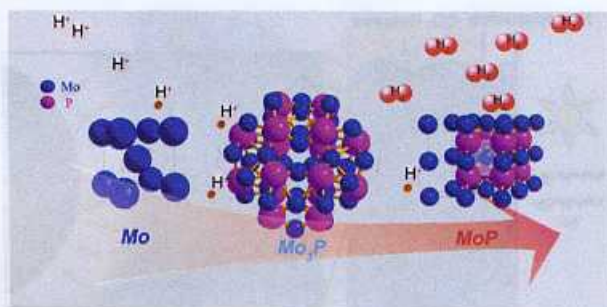


Efficient, high yield perovskite photovoltaic devices grown by interdiffusion of solution-processed precursor stacking layers

Zhengguo Xiao, Cheng Bi, Yuchuan Shao, Qingfeng Dong, Qi Wang, Yongbo Yuan, Chenggong Wang, Yongli Gao and Jinsong Huang*

A new low-temperature all-solution approach was invented to produce perovskite solar cells with an efficiency of 15.4% at high device yield.

2624



Molybdenum phosphide as an efficient electrocatalyst for the hydrogen evolution reaction

Peng Xiao, Mahasin Alam Sk, Larissa Thia, Xiaoming Ge, Rern Jern Lim, Jing-Yuan Wang, Kok Hwa Lim and Xin Wang*

The phosphorization of molybdenum leads to a good non-noble metal catalyst for the hydrogen evolution reaction in both acidic and alkaline conditions.

2630

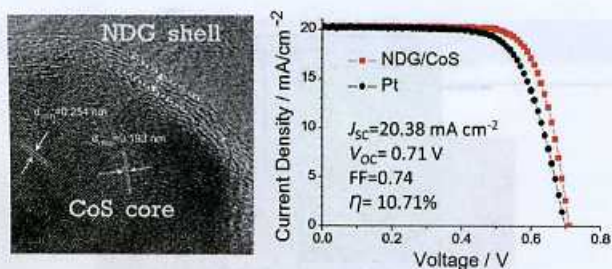


Advanced hybrid Li-air batteries with high-performance mesoporous nanocatalysts

Longjun Li, Song-Hai Chai, Sheng Dai and Arumugam Manthiram*

Advanced hybrid Li-air batteries are enabled by decoupled, high-performance mesoporous nanocatalysts.

2637



A quasi core-shell nitrogen-doped graphene/cobalt sulfide conductive catalyst for highly efficient dye-sensitized solar cells

Enbing Bi, Han Chen,* Xudong Yang, Wenqin Peng, Michael Grätzel and Liyuan Han*

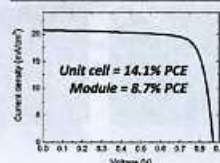
A platinum-free counter electrode was designed based on a quasi core-shell N-doped graphene/cobalt sulfide with high catalytic activity and conductivity.

2642

Benefits of very thin PCBM and LiF layers for solution-processed p-i-n perovskite solar cells

Jangwon Seo, Sangman Park, Young Chan Kim, Nam Joong Jeon, Jun Hong Noh, Sung Cheol Yoon* and Sang Il Seok*

Optimal thickness of a PCBM layer and insertion of the LiF interlayer on a well-controlled flat surface of the perovskite film are essential for fabricating planar perovskite-PCBM solar cells.

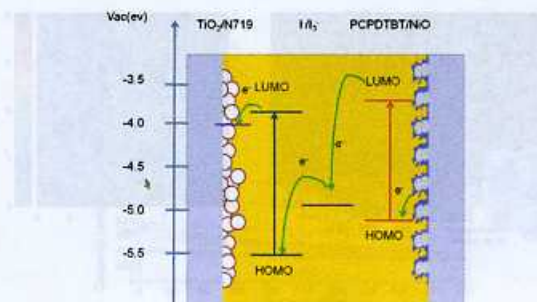


2647

Polymer based photocathodes for panchromatic tandem dye-sensitized solar cells

ZhiPeng Shao, Xu Pan,* HaiWei Chen, Li Tao, WenJun Wang, Yong Ding, Bin Pan, Shangfeng Yang and Songyuan Dai*

A novel polymer based photocathode with a secondary porous structure was developed for tandem dye-sensitized solar cells (pn-DSCs). Complementary absorption was realized in pn-DSCs. The resulting tandem devices achieved a panchromatic absorption and a power conversion efficiency of 1.30%.



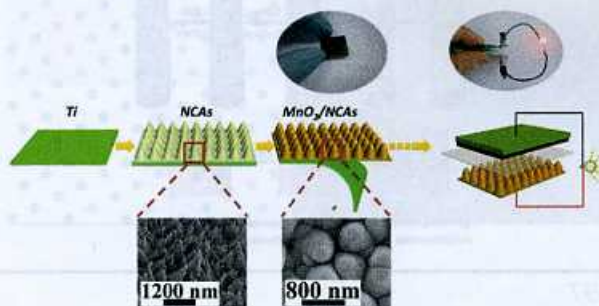
PAPERS

2652

Scalable fabrication of MnO₂ nanostructure deposited on free-standing Ni nanocone arrays for ultrathin, flexible, high-performance micro-supercapacitor

Zijin Su, Cheng Yang,* Binghe Xie, Ziyin Lin, Zhexu Zhang, Jingping Liu, Baohua Li, Feiyu Kang and Ching Ping Wong

A thin film of Ni nanocone arrays loaded with MnO₂ nanostructures is prepared by an electro-deposition process and peeled off from the carrier substrate. This electrode shows superior performance for micro-supercapacitors.



2660

Insights into the catalytic activity and surface modification of MoO₃ during the hydrodeoxygenation of lignin-derived model compounds into aromatic hydrocarbons under low hydrogen pressures

Teerawit Prasomsri, Manish Shetty, Karthick Murugappan and Yuriy Román-Leshkov*

MoO₃ is an effective catalyst for the hydrodeoxygenation (HDO) of lignin-derived oxygenates to generate high yields of aromatic hydrocarbons without ring-saturated products.

