

## IN THIS ISSUE

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### Cover

See Lee *et al.*, pp. 1811–1817.  
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### Inside cover

See Román-Leshkov *et al.*, pp. 1732–1738.  
Image reproduced by permission of Yuriy Román-Leshkov from *Energy Environ. Sci.*, 2013, **6**, 1732.

## REVIEWS

1656

### Metal–organic frameworks as platforms for clean energy

Shun-Li Li and Qiang Xu\*

This review discusses the state-of-the-art of metal–organic frameworks (MOFs) as platforms for clean energy. A survey of the research progresses in the applications of MOFs for hydrogen energy (hydrogen sorption, nanoconfinement of chemical hydrides, hydrogen generation), fuel cells, Li-ion rechargeable batteries, supercapacitors and solar cells is given.

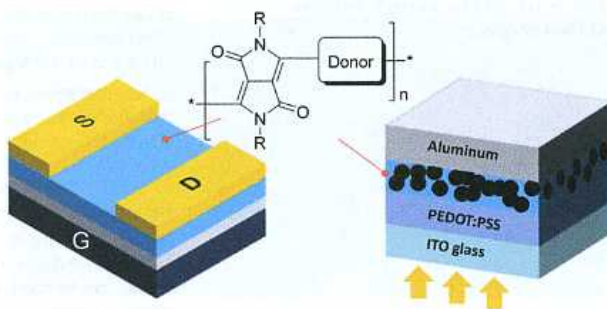


1684

### High mobility diketopyrrolopyrrole (DPP)-based organic semiconductor materials for organic thin film transistors and photovoltaics

Yuning Li,\* Prashant Sonar, Leanne Murphy and Wei Hong

This review discusses recent progress made in the diketopyrrolopyrrole (DPP)-containing semiconductors with mobility  $\geq 0.1 \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$  for OTFTs and OPVs.



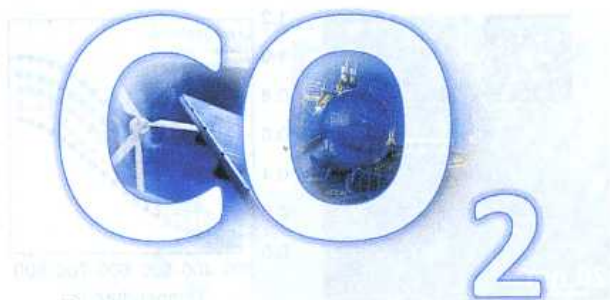


1711

### Catalysis for CO<sub>2</sub> conversion: a key technology for rapid introduction of renewable energy in the value chain of chemical industries

Gabriele Centi,<sup>\*</sup> Elsje Alessandra Quadrelli<sup>\*</sup> and Siglinda Perathoner<sup>\*</sup>

The options and catalysts for using CO<sub>2</sub> to introduce renewable energy in the chemical production value chain are discussed.



## COMMUNICATIONS

1732

### Effective hydrodeoxygenation of biomass-derived oxygenates into unsaturated hydrocarbons by MoO<sub>3</sub> using low H<sub>2</sub> pressures

Teerawit Prasomsri, Tarit Nimmanwudipong and Yuriy Román-Leshkov<sup>\*</sup>

Highly selective production of unsaturated hydrocarbons from biomass-derived oxygenates by the MoO<sub>3</sub> catalyst with low H<sub>2</sub> pressures.

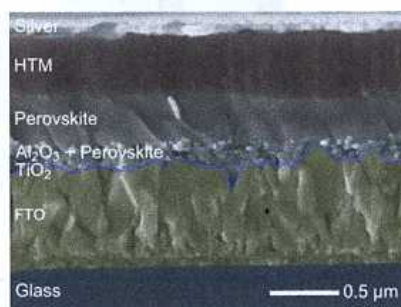


1739

### Low-temperature processed meso-structured to thin-film perovskite solar cells

James M. Ball, Michael M. Lee, Andrew Hey and Henry J. Snaith<sup>\*</sup>

CH<sub>3</sub>NH<sub>3</sub>PbI<sub>3-x</sub>Cl<sub>x</sub>-based photoactive layers exhibit ambipolar charge-transport in thin-films and, when solution-processed at 150 °C, perform with 12.3% efficiency in solar cells.

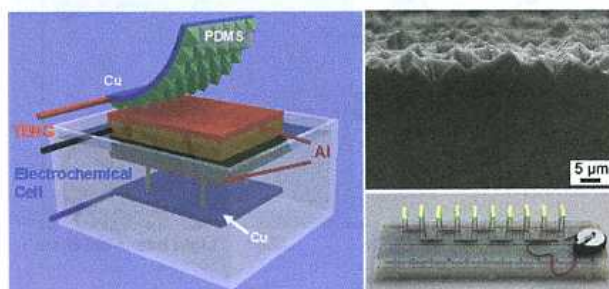


1744

### Simultaneously harvesting mechanical and chemical energies by a hybrid cell for self-powered biosensors and personal electronics

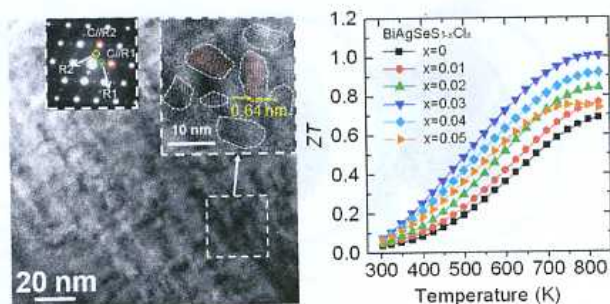
Ya Yang, Hulin Zhang, Jun Chen, Sangmin Lee, Te-Chien Hou and Zhong Lin Wang<sup>\*</sup>

The mechanical and chemical energies were harvested by a hybrid cell for self-powered biosensors and personal electronics.





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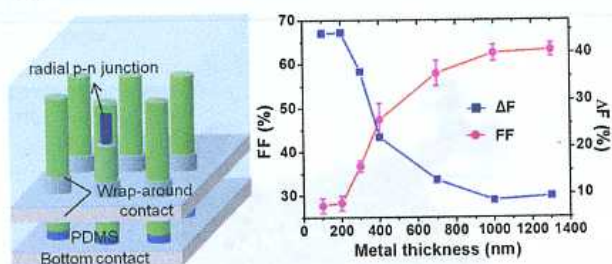


### High thermoelectric performance in n-type BiAgSeS due to intrinsically low thermal conductivity

Yan-Ling Pei, Haijun Wu, Jiehe Sui, Jing Li, David Berardan, Celine Barreateau, Lin Pan, Nita Dragoe, Wei-Shu Liu, Jiaqing He\* and Li-Dong Zhao\*

Intrinsically low thermal conductivity coupling with enhanced electrical transport properties leads to a  $ZT \sim 1.0$  at 823 K for  $\text{BiAgSeS}_{0.97}\text{Cl}_{0.03}$ .

1756

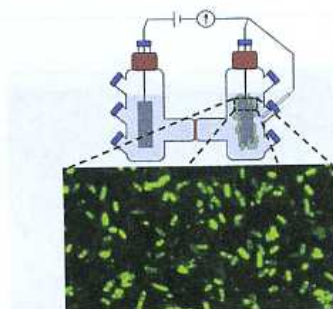


### A novel wrap-around metal contact optimized for radial p-n junction Si wire solar cells

Sun-Mi Shin, Jin-Young Jung, Kwang-Tae Park, Han-Don Um, Sang-Won Jee, Yoon-Ho Nam and Jung-Ho Lee\*

A novel wrap around top-contact method for radial junction wire solar cells has been developed without the need for transparent conducting oxides.

1761

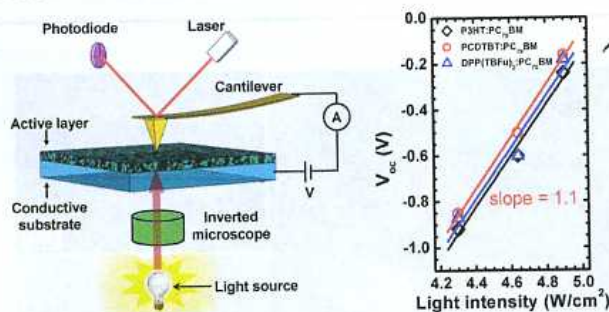


### A lipid membrane intercalating conjugated oligoelectrolyte enables electrode driven succinate production in *Shewanella*

Alexander W. Thomas, Logan E. Garner, Kelly P. Nevin, Trevor L. Woodard, Ashley E. Franks, Derek R. Lovley, James J. Sumner, Christian J. Sund and Guillermo C. Bazan\*

A synthetic, lipid membrane intercalating molecule enables *Shewanella* to use a graphite electrode as the sole electron donor for production of succinate.

1766



### High light intensity effects on nanoscale open-circuit voltage for three common donor materials in bulk heterojunction solar cells

Yuan Zhang, Xuan-Dung Dang, Martijn Kuik, Sarah R. Cowan, Peter Zalar, Chunki Kim and Thuc-Quyen Nguyen\*

The  $V_{oc}$  of three benchmarked organic bulk heterojunctions shows a unified electrode work function dependence measured by photoconductive atomic force microscopy.

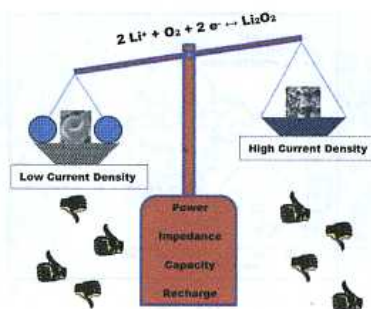


1772

### Current density dependence of peroxide formation in the Li-O<sub>2</sub> battery and its effect on charge

Brian D. Adams, Claudio Radtke, Robert Black, Michel L. Trudeau, Karim Zaghib and Linda F. Nazar\*

We report a significant difference in the growth mechanism of Li<sub>2</sub>O<sub>2</sub> in Li-O<sub>2</sub> batteries for toroidal and thin-film morphologies which is dependent on the current rate that governs the electrochemical pathway.

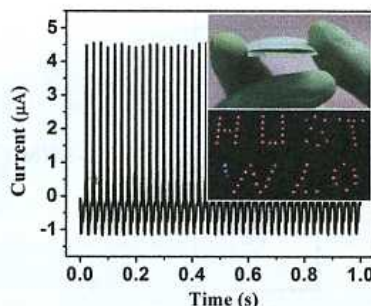


1779

### A paper-based nanogenerator as a power source and active sensor

Qize Zhong, Junwen Zhong, Bin Hu, Qiyi Hu, Jun Zhou\* and Zhong Lin Wang

The paper-based nanogenerator endowed the conventional paper with new applications in energy harvesting and sensing.

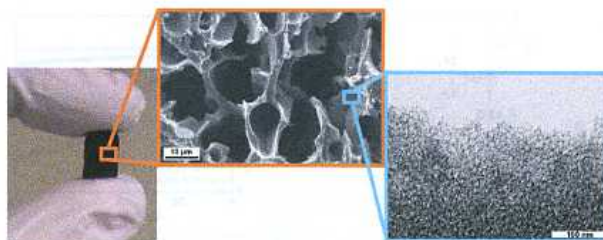


1785

### A facile approach for the synthesis of monolithic hierarchical porous carbons – high performance materials for amine based CO<sub>2</sub> capture and supercapacitor electrode

Luis Estevez, Rubal Dua, Nidhi Bhandari, Anirudh Ramanujapuram, Peng Wang\* and Emmanuel P. Giannelis\*

A facile, inexpensive and green approach is reported for the synthesis of hierarchically porous carbon monoliths with tunable porosities.

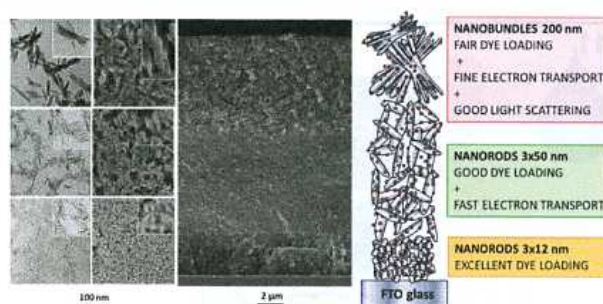


1791

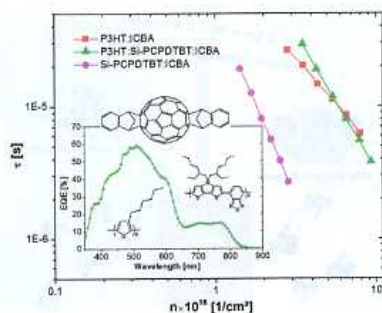
### Shape-tailored TiO<sub>2</sub> nanocrystals with synergistic peculiarities as building blocks for highly efficient multi-stack dye solar cells

Luisa De Marco, Michele Manca,\* Roberto Giannuzzi, Maria R. Belviso, P. Davide Cozzoli and Giuseppe Gigli

A novel multi-layered photoelectrode embodying three different breeds of shape-tailored TiO<sub>2</sub> nanorods enables dye solar cells to achieve a superior energy conversion efficiency.



1796

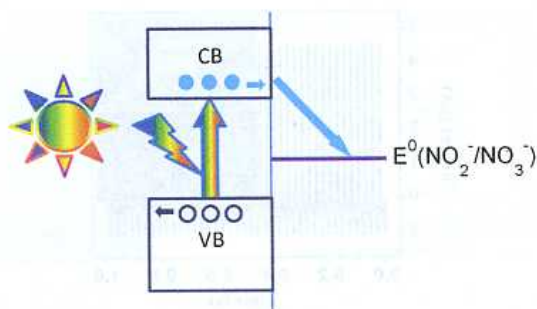


### IR sensitization of an indene-C60 bisadduct (ICBA) in ternary organic solar cells

Tayebeh Ameri,\* Thomas Heumüller, Jie Min, Ning Li, Gebhard Matt, Ullrich Scherf and Christoph J. Brabec

We demonstrate a smart strategy to sensitize the indene-C60 bisadduct in the near IR region employing the concept of ternary organic solar cells.

1802

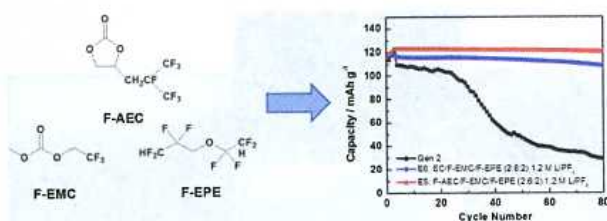


### Photoelectrochemical reduction of nitrates at the illuminated p-GaInP<sub>2</sub> photoelectrode

Heli Wang\* and John A. Turner

Nitrates are photoelectrochemically reduced at the p-GaInP<sub>2</sub> electrode with very high efficiency, by promoting the rate-determining step with illumination.

1806



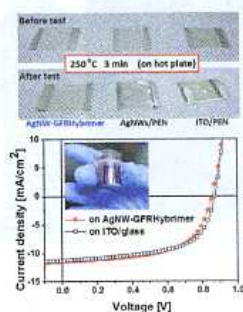
### Fluorinated electrolytes for 5 V lithium-ion battery chemistry

Zhengcheng Zhang,\* Libo Hu, Huiming Wu, Wei Weng, Meiten Koh, Paul C. Redfern, Larry A. Curtiss and Khalil Amine

Fluorinated electrolytes for LTO/LNMO high voltage lithium ion batteries.

## PAPERS

1811



### High-performance hybrid plastic films: a robust electrode platform for thin-film optoelectronics

Jungho Jin, Jaemin Lee, Seonju Jeong, SeungCheol Yang, Ji-Hoon Ko, Hyeon-Gyun Im, Se-Woong Baek, Jung-Yong Lee\* and Byeong-Soo Bae\*

A flexible hybrid film is proposed as a robust electrode for thin-film optoelectronic devices: a silver nanowire embedded glass-fabric reinforced hybrimer.

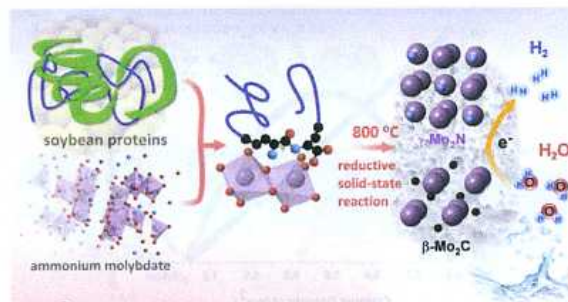


1818

### Biomass-derived electrocatalytic composites for hydrogen evolution

Wei-Fu Chen,\* Shilpa Iyer, Shweta Iyer, Kotaro Sasaki,\* Chiu-Hui Wang, Yimei Zhu, James T. Muckerman\* and Etsuko Fujita

An inexpensive catalyst made from soybeans and molybdenum generates hydrogen sustainably in acidic water.

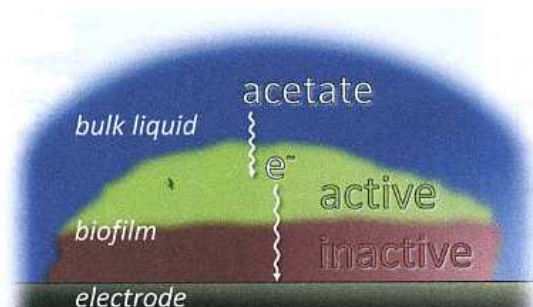


1827

### Metabolic spatial variability in electrode-respiring *Geobacter sulfurreducens* biofilms

R. S. Renslow, J. T. Babauta, A. C. Dohnalkova, M. I. Boyanov, K. M. Kemner, P. D. Majors, J. K. Fredrickson and H. Beyenal\*

Depth-profile measurements inside *Geobacter sulfurreducens* biofilms, generated using an electrochemical-nuclear magnetic resonance microimaging biofilm reactor, reveal metabolic inactivity near the base of the biofilm due to electron donor limitations.

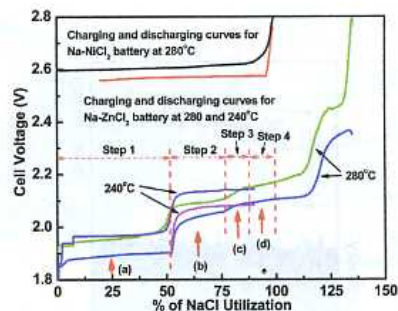


1837

### A novel low-cost sodium–zinc chloride battery

Xiaochuan Lu, Guosheng Li, Jin Y. Kim,\* John P. Lemmon, Vincent L. Sprenkle and Zhenguo Yang

The Na–ZnCl<sub>2</sub> battery showed multiple electrochemical reactions with formation of a few solid and liquid phases at the operating temperature of 280 °C.



1844

### Direct conversion of *Spirulina* to ethanol without pretreatment or enzymatic hydrolysis processes

Shimpei Aikawa, Ancy Joseph, Ryosuke Yamada, Yoshihiro Izumi, Takahiro Yamagishi, Fumio Matsuda, Hiroshi Kawai, Jo-Shu Chang, Tomohisa Hasunuma and Akihiko Kondo\*

A combination of lysozyme and recombinant amylase-expressing yeast directly converts *Spirulina* to ethanol without pretreatment or enzymatic hydrolysis.

