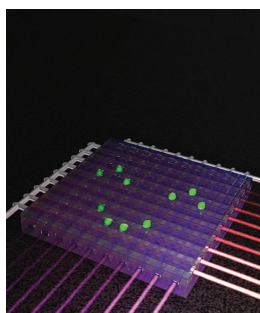


# ADVANCED FUNCTIONAL MATERIALS

[www.afm-journal.de](http://www.afm-journal.de)

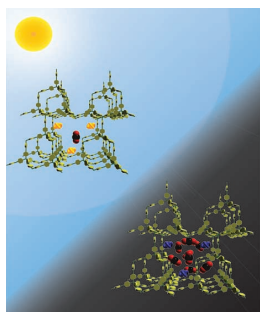
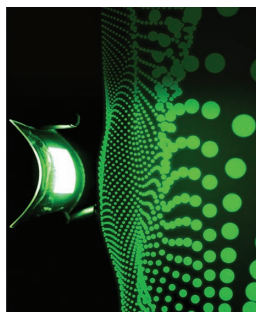


## Flexible Electronics

On page 4390, S. Watanabe, K. Soga, and co-workers fabricate flexible upconversion transparent displays by constructing arrayed waveguide gratings on upconversion luminescent layers consisting of rare-earth-ion-doped nanoparticles excited with near-infrared laser beams at 850 nm and 1500 nm, which leads to two dimensional imaging on passive matrix mode without mirrors, transparent electrodes, and electric circuits in display monitors.

## Organic Electronics

Nanocomposite cathode structures with the aim of combining mechanical and electronic properties to achieve better performance in an organic flexible are examined by D. L. Carroll and team on page 4397. A flexible high-efficiency alternating current (AC) driven field-induced polymer electroluminescent device is chosen as the platform system with the understanding that this approach to organic devices clearly points to organic light emitting diodes, organic thin-film transistors, and other flexible systems.

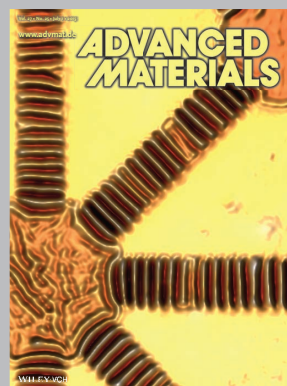
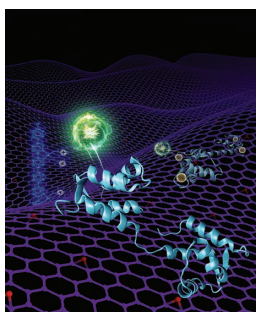


## Metal-Organic Frameworks

A new type of photodynamic carbon capture material with up to 26 wt% CO<sub>2</sub> desorption capacity is synthesized via incorporation of diarylethene as guest molecules in porous aromatic framework-1. As reported by M. R. Hill, B. P. Ladewig, and colleagues on page 4405, this material can simply adsorb and desorb carbon dioxide on application of broad spectrum light similar to sunlight.

## Conformation Changes

A novel and unconventional hybrid material consisting of graphene oxide (GO) and positively charged organic polymer for detection of the conformation transition of calmodulin by using fluorescence resonance energy transfer (FRET) technique is developed on page 4412 by C. Xing, Y. Zhan, S. Wang, and co-workers. This effort provides first example of how FRET technique can be used with GO and optical functional materials to detect CaM.



*Advanced Materials* has been bringing you the best in materials research for over twenty-five years.

With its increased ISI Impact Factor of 17.493, *Advanced Materials* is one of the most influential journals in the field. Publishing every week, *Advanced Materials* now brings you even more of the latest results at the cutting edge of materials science.

[www.advmat.de](http://www.advmat.de)



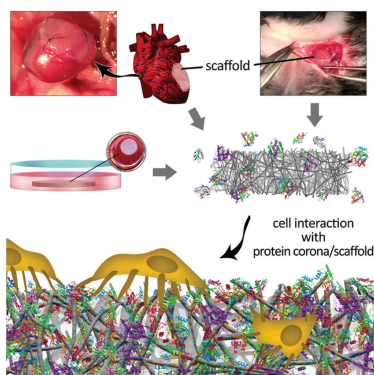
*Small* is the very best interdisciplinary forum for all experimental and theoretical aspects of fundamental and applied research at the micro and nano length scales.

With an ISI impact Factor of 8.368 and publishing every week in 2015 with papers online in advance of print, *Small* is your first-choice venue for top-quality communications, detailed full papers, cutting-edge concepts, and in-depth reviews of all things micro and nano.

[www.small-journal.com](http://www.small-journal.com)

## FULL PAPERS

The formation of “protein corona” complexes onto the nanofibrillar structure of tissue engineering collagen-based scaffolds is evaluated. The corona decorations formed onto collagen matrices are tissue-specific and subject's health-specific, and regulated cellular secretome *ex vivo*. In sum, the results demonstrate the significance of protein corona formation onto tissue engineered constructs in the cell–biomaterial interactions.

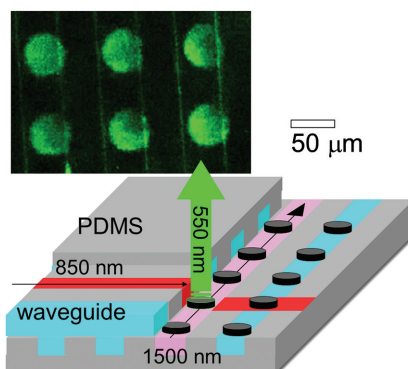


## Biosensors

V. Serpooshan, M. Mahmoudi,\*  
M. Zhao, K. Wei, S. Sivanesan,  
K. Motamedchaboki, A. V. Malkovskiy,  
A. B. Goldstone, J. E. Cohen, P. C. Yang,  
J. Rajadas, D. Bernstein, Y. J. Woo,  
P. Ruiz-Lozano\* .....4379–4389

Protein Corona Influences Cell–  
Biomaterial Interactions in  
Nanostructured Tissue Engineering  
Scaffolds

Arrayed waveguide gratings consisting of two optical polymers are fabricated on patterned upconversion luminescent layers prepared with rare-earth-ion-doped nanoparticle films for upconversion transparent displays. These displays take advantage of long-operating lifetimes, high transparency, and mechanical flexibility, and do not require mirrors, transparent electrodes, transistor circuits, leading to the fabrication with low cost, minimized material consumptions, and few fabrication steps.



## Flexible Electronics

S. Watanabe,\* T. Asanuma,  
T. Sasahara, H. Hyodo,  
M. Matsumoto, K. Soga\* .....4390–4396

3D Micromolding of Arrayed Waveguide  
Gratings on Upconversion Luminescent  
Layers for Flexible Transparent Displays  
without Mirrors, Electrodes, and Electric  
Circuits

Nanocomposite cathode structures—in this case metals together with multiwalled nanotubes—with the aim of combining mechanical and electronic properties to achieve better performance in an organic flexible are examined. A flexible high-efficiency alternating current (AC) driven field-induced polymer electroluminescent device is chosen as the platform system with the understanding that this approach to organic devices clearly points to organic light emitting diodes, organic thin-film transistors, and other flexible systems.

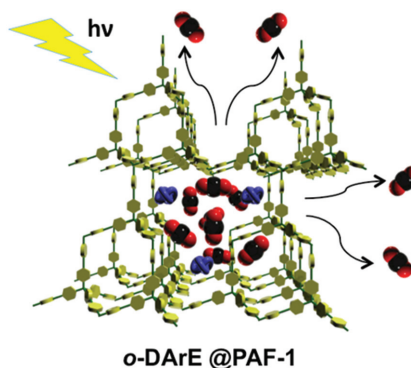


## Organic Electronics

J. Xu, G. M. Smith, C. Dun, Y. Cui,  
J. Liu, H. Huang, W. Huang,  
D. L. Carroll\* .....4397–4404

Layered, Nanonetwork Composite  
Cathodes for Flexible, High-Efficiency,  
Organic Light Emitting Devices

Dynamic light-activated carbon capture and release in porous aromatic framework-1 (PAF-1) is achieved by successfully loading diarylethene (DArE) as a guest molecule. Up to 26 wt% CO<sub>2</sub> desorption capacity is possible with 50 wt% DArE loading. The observed photodynamicity occurs because of host–guest competition between DArE and CO<sub>2</sub> inside the sterically hindered pores of PAF-1.



## Metal-Organic Frameworks

R. Lyndon, K. Konstas, R. A. Evans,  
D. J. Keddie, M. R. Hill,\*  
B. P. Ladewig\* .....4405–4411

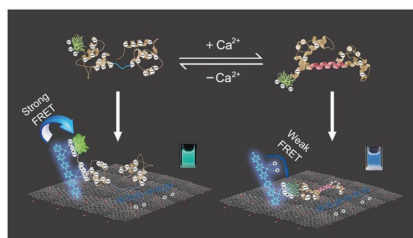
Tunable Photodynamic Switching of  
DArE@PAF-1 for Carbon Capture

## FULL PAPERS

## Conformation Changes

H. Yuan, J. Qi, C. Xing,\* H. An, R. Niu,  
Y. Zhan,\* Y. Fan, W. Yan, R. Li, B. Wang,  
S. Wang\*..... 4412–4418

**Graphene-Oxide-Conjugated Polymer  
Hybrid Materials for Calmodulin Sensing  
by Using FRET Strategy**

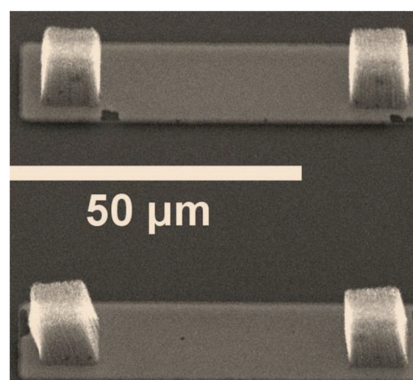


A hybrid probe of graphene oxide cationic conjugated polymer is demonstrated for the detection of  $\text{Ca}^{2+}$ -induced conformation changes of calmodulin by using FRET technique. The detection is based on the electrostatic and hydrophobic interactions between CaM and GO, and the assembly of CaM with GO is quantitatively and reversibly controlled by  $\text{Ca}^{2+}$  ions.

## Carbon Nanomaterials

M. Ahmad, J. V. Anguita, V. Stolojan,  
T. Corless, J.-S. Chen, J. D. Carey,  
S. R. P. Silva\*..... 4419–4429

**High Quality Carbon Nanotubes on  
Conductive Substrates Grown at Low  
Temperatures**

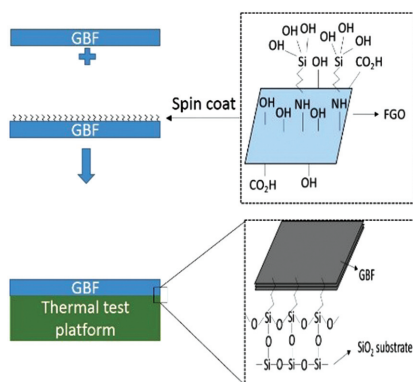


Growth of high quality carbon nanotubes on metallic substrates at low temperatures (350–440 °C) for various electronic applications is achieved by optimizing the thickness of TiN under-layer in a photothermal chemical vapor deposition system. The thickness of a conductive TiN layer plays a determining role in tuning nanotube characteristics such as metallicity, diameter, walls, quality, growth rate, and so on.

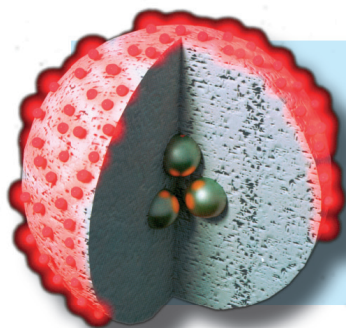
## Graphene

Y. Zhang, H. Han,\* N. Wang, P. Zhang,  
Y. Fu, M. Murugesan, M. Edwards,  
K. Jeppson, S. Volz, J. Liu\*... 4430–4435

**Improved Heat Spreading Performance  
of Functionalized Graphene in  
Microelectronic Device Application**



Graphene-based film (GBF) functionalized with silane molecules doubles the heat spreading ability. Molecular dynamics (MD) simulations show that the thermal conductivity ( $\kappa$ ) of the GBF increased by 15%–56% compared to that with the nonfunctionalized graphene substrate. The enhancement of the thermal performance by inserting silane-functionalized molecules holds great potential for applications in thermal management field.



## How to contact us:

## Editorial Office:

Phone: (+49) 6201-606-286/531  
Fax: (+49) 6201-606-500  
Email: [afm@wiley-vch.de](mailto:afm@wiley-vch.de)

## Reprints:

[cherth@wiley-vch.de](mailto:cherth@wiley-vch.de)

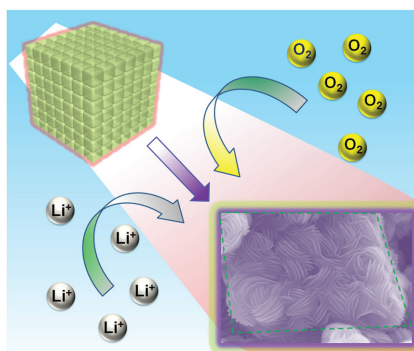
## Copyright Permission:

Fax: (+49) 6201-606-332  
Email: [rights@wiley-vch.de](mailto:rights@wiley-vch.de)



## FULL PAPERS

**Mesoporous carbon nanocubes (MCCs)** are synthesized by a chemical vapor deposition method. Oxygen electrode made of MCCs contains a hierarchical porous structure, which can facilitate oxygen diffusion, electrolyte impregnation, and accommodation of discharge products during the charge and discharge processes.

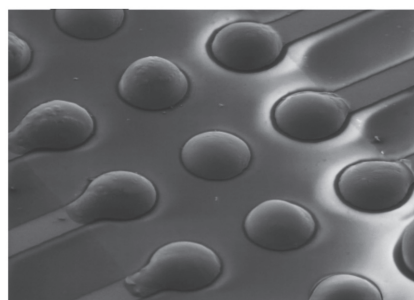


## Batteries

B. Sun, S. Chen, H. Liu,  
G. Wang\* .....4436–4444

### Mesoporous Carbon Nanocube Architecture for High-Performance Lithium–Oxygen Batteries

This work introduces a novel technique for creating 3D microstructures of **Galinstan** using dielectrophoresis. It enables the rapid formation of multiple microstructures with controllable diameters and aspect ratios. Proof-of-concept experiments are conducted by utilizing the patterned microstructures as 3D microelectrodes for enhancing the trapping of suspended nanoparticles, and as microfins to improve the convective heat transfer within a microfluidic channel.

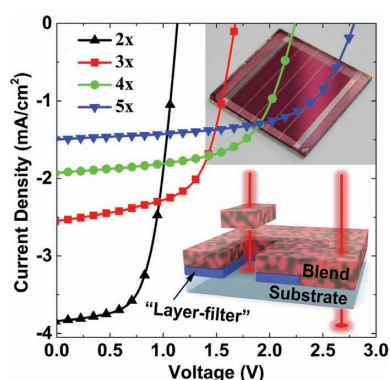


## Liquid Metals

S.-Y. Tang,\* J. Zhu, V. Sivan, B. Gol,  
R. Soffe, W. Zhang, A. Mitchell,\*  
K. Khoshmanesh\* .....4445–4452

### Creation of Liquid Metal 3D Microstructures Using Dielectrophoresis

**Layer-filter threshold (LFT)** technique based on near-infrared laser is proposed and demonstrated, which enables the patterning strategy through an interlayer explosion effect with high precision and easily reachable operating conditions. Thus obtained organic photovoltaic modules reach geometric fill factors exceeding 90% and maintain the performances with increasing number of interconnected cells, which verifies the potential of LFT technique in the patterning of organic semiconductor devices.

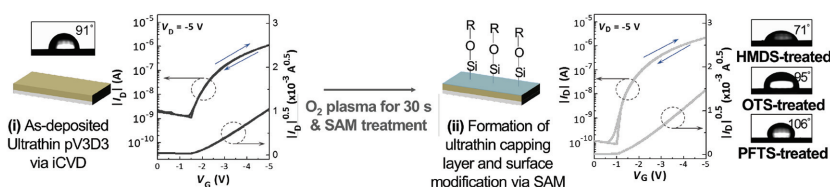


## Organic Semiconductors

F. Ye, Z. Chen, X. Zhao, J. Chen,  
X. Yang\* .....4453–4461

### “Layer-Filter Threshold” Technique for Near-Infrared Laser Ablation in Organic Semiconductor Device Processing

A **molecular-thin oxide capping layer** is formed on ultrathin ( $\approx 15$  nm) polymer dielectrics by a brief oxygen plasma treatment to enhance the thermal stability up to 280 °C. The formed silanol functionalities at the surface can also be utilized to modify the surface of ultrathin dielectrics by use of various silane compounds, which enable tailoring the interface between semiconductor and ultrathin dielectrics.



## Organic Electronics

H. Seong, J. Baek, K. Pak,  
S. G. Im\* .....4462–4469

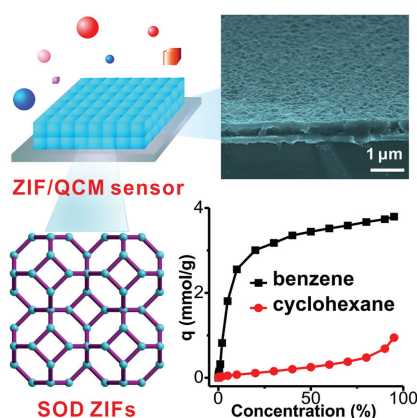
### A Surface Tailoring Method of Ultrathin Polymer Gate Dielectrics for Organic Transistors: Improved Device Performance and the Thermal Stability Thereof

## FULL PAPERS

## Chemical Detection

M. Tu, S. Wannapaiboon, K. Khaletskaya,  
R. A. Fischer\* ..... 4470–4479

**Engineering Zeolitic-Imidazolate Framework (ZIF) Thin Film Devices for Selective Detection of Volatile Organic Compounds**

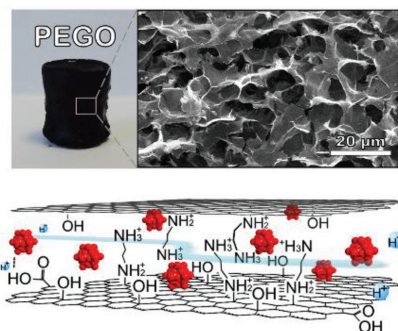


A convenient method is employed to fabricate uniform thin films of zeolitic-imidazolate frameworks (ZIFs) with controllable thickness on silica coated quartz crystal microbalance (QCM) substrates. Because of the effects of ZIF pore size, limited pore diameter, surface functionality, and structural flexibility, the ZIF/QCM hybrid devices exhibit selective adsorption (detection) behavior upon exposure to various vapor phase volatile organic compounds.

## Proton Transport

Y. Liu, S. Liu, X. Lai, J. Miao, D. He,  
N. Li, F. Luo,\* Z. Shi,  
S. Liu\* ..... 4480–4485

**Polyoxometalate-Modified Sponge-Like Graphene Oxide Monolith with High Proton-Conducting Performance**



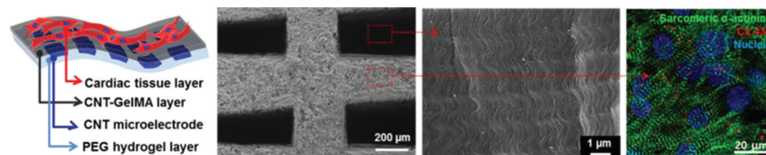
Polyoxometalate-modified sponge-like graphene oxide monolith with 3D cross-linked inner structure is synthesized. The excellent proton conductivity originates from 3D transporting pathways, higher content of hopping sites, more delocalized hydrogen ions, and eliminated grain boundary resistance. This study provides a practical way to design GO-based proton-conducting material dominated by in-plane diffusion.

## Cardiac Tissue

S. R. Shin, C. Shin, A. Memic,  
S. Shadmehr, M. Miscuglio, H. Y. Jung,  
S. M. Jung, H. Bae, A. Khademhosseini,  
X. (Shirley) Tang,\*  
M. R. Dokmeci\* ..... 4486–4495

**Aligned Carbon Nanotube-Based Flexible Gel Substrates for Engineering Biohybrid Tissue Actuators**

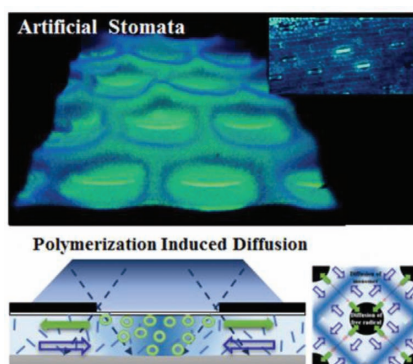
Aligned carbon nanotubes (CNTs) are successfully embedded into flexible and bio-compatible self-standing cardiac muscle tissue exhibiting excellent anisotropic electrical conductivity. This centimeter-scale biohybrid machine has excellent mechanical integrity, embedded microelectrodes, and is capable of spontaneous linear cyclic contraction/extension actuation. It is demonstrated that a biohybrid machine can be controlled by electrical signals provided by integrated CNT microelectrode arrays.



## Functional Membranes

H. Kim, S. J. Lee\* ..... 4496–4505

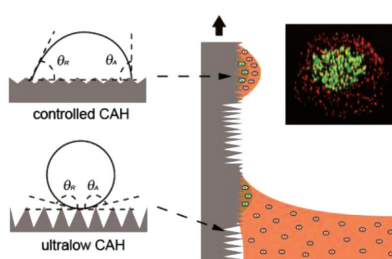
**Stomata-Inspired Membrane Produced Through Photopolymerization Patterning**



An innovative stomata-inspired membrane (SIM) is fabricated by using a temperature-responsive hydrogel through a patterned photopolymerization. Polymerization-induced diffusion on the macroscale surface results in formation of a double-parted polymer membrane with controllable pores in single illumination, and each part exhibits different mechanical functions. The easily fabricated sensing-to-actuation functions of SIM can be used in numerous practical applications.

## FULL PAPERS

**From bad to good:** Large contact angle hysteresis (CAH, defined by  $\theta_A - \theta_R$ ) that causes pinning of droplet on surface is often an unfavorable factor in surface chemistry. It is, however, harnessed in constructing a semi-egg-like hydrogel for 3D heterogeneous compartmentalization of cells. By designing surface with controlled-CAH patterns and ultralow-CAH background, the semi-egg-like architecture is fabricated by dip-coating in a facile way.

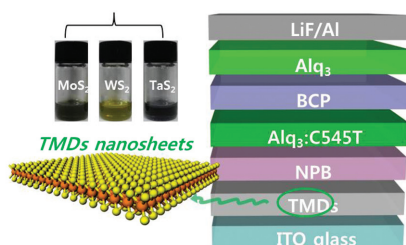


## Surface Chemistry

K. Sun, M. Liu, H. Liu, P. Zhang, J. Fan, J. Meng, S. Wang\* .....4506–4511

## Semi-Egg-Like Heterogeneous Compartmentalization of Cells Controlled by Contact Angle Hysteresis

**2D transition metal dichalcogenide (TMD) nanosheets**, including  $\text{MoS}_2$ ,  $\text{WS}_2$ , and  $\text{TaS}_2$ , are used as hole injection layers (HILs) in organic light-emitting diodes (OLEDs).  $\text{MoS}_2$ ,  $\text{WS}_2$ , and  $\text{TaS}_2$  nanosheets are prepared using an exfoliation by an ultrasonication method. It is shown that the stability of the devices in air can be prolonged by using UV/ozone-treated TMDs as HILs in OLEDs.

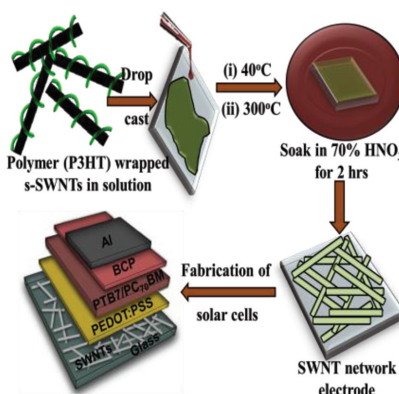


## Organic Electronics

C. Kim, T. P. Nguyen, Q. V. Le, J.-M. Jeon, H. W. Jang,\* S. Y. Kim\* .....4512–4519

## Performances of Liquid-Exfoliated Transition Metal Dichalcogenides as Hole Injection Layers in Organic Light-Emitting Diodes

**Fabrication of electronic-type separated single-walled carbon nanotube (SWNT) electrodes** for organic solar cells, using a simple drop cast method followed by thermal and acid treatment. The thermal and acid treatment processes significantly enhance the conductivity of the SWNT films, enabling the use of the conductivity-enhanced SWNT layers as hole extracting, transparent electrodes in organic bulk heterojunction solar cells.

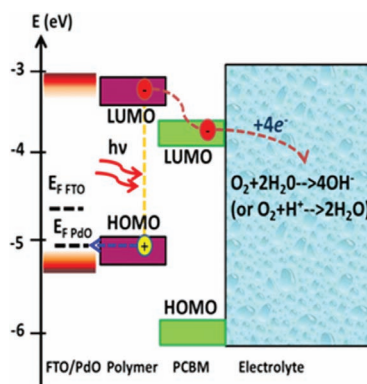


## Solar Cells

G. D. M. R. Dabera, M. R. R. Prabath, K. T. Lai, K. D. G. I. Jayawardena, F. L. M. Sam, L. J. Rozanski, A. A. D. T. Adikaari, S. R. P. Silva\* .....4520–4530

## Does Electronic Type Matter when Single-Walled Carbon Nanotubes are Used for Electrode Applications?

**A photoelectrochemical sensor for dissolved oxygen**, based on the hybrid interface between an organic semiconductor and a nanostructured metal oxide, is realized. State-of-the-art sensitivity, good electrochemical stability, and high reproducibility in different environmental conditions, ranging from acid to basic pH, are reported, making the polymer-based device suitable for applications in waste water treatment, environmental monitoring and water splitting.



## Oxygen Sensors

S. Bellani, A. Ghadirzadeh, L. Meda, A. Savoini, A. Tacca, G. Marra, R. Meira, J. Morgado, F. Di Fonzo,\* M. R. Antognazza\* .....4531–4538

## Hybrid Organic/Inorganic Nanostructures for Highly Sensitive Photoelectrochemical Detection of Dissolved Oxygen in Aqueous Media

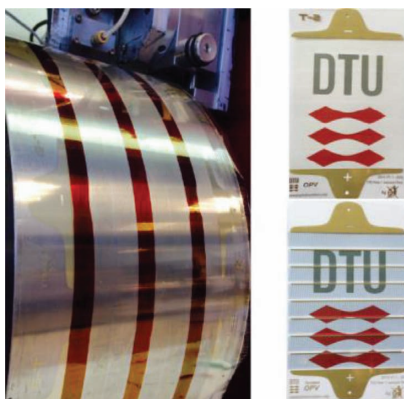


## FULL PAPERS

## Optoelectronics

D. Angmo, T. R. Andersen, J. J. Bentzen, M. Helgesen, R. R. Søndergaard, M. Jørgensen, J. E. Carlé, Eva Bundgaard, F. C. Krebs\* ...4539–4547

**Roll-to-Roll Printed Silver Nanowire Semitransparent Electrodes for Fully Ambient Solution-Processed Tandem Polymer Solar Cells**

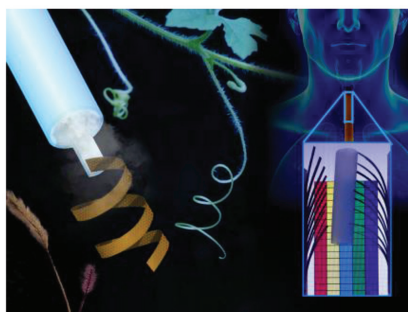


**Rolling in tandem:** Roll-to-roll rotary screen printing of silver nanowires (AgNWs) and zinc oxide (ZnO) is realized on flexible substrates enabling large-area semi-transparent electrodes with >80% transmission. This electrode is employed in all-ambient roll-coating of single and tandem polymer solar cells. AgNW/ZnO proves highly suitable especially for tandem structures while the traditional indium-tin-oxide replacement—Flextrode—remains unbeaten in single cells with wide band-gap polymers.

## Smart Actuators

D.-D. Han, Y.-L. Zhang,\* Y. Liu, Y.-Q. Liu, H.-B. Jiang, B. Han, X.-Y. Fu, H. Ding, H.-L. Xu, H.-B. Sun\* .....4548–4557

**Bioinspired Graphene Actuators Prepared by Unilateral UV Irradiation of Graphene Oxide Papers**



**A facile preparation of graphene actuators** by unilateral UV irradiation of graphene oxide (GO) papers is reported. Anisotropic GO/reduced GO bilayer paper can be directly prepared by controlling the photoreduction gradient. As typical examples, smart humidity-driven graphene actuators that mimic the cilia of respiratory tract and the tendrils of climber plants are developed for object transport.

## WILEY SPOTLIGHT APPS

### Download free today

Wiley Spotlight Apps are essential for all researchers, faculty, students and professionals. Whether you want to keep track of broad trends across your discipline or focus on a subfield, the Spotlight Apps are indispensable tools for your research and teaching.

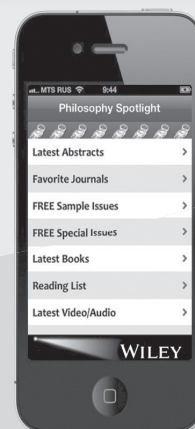
**These apps will give you the following features at your fingertips, anytime, anywhere:**

- Up-to-the-minute abstracts from leading journals in your field
- Cutting-edge Special and Virtual Issues, with free content
- Latest Video Abstracts, Expert Publishing Workshops, and Informative Podcasts
- Updates and news on key conferences
- And more!

[www.wileyspotlights.com](http://www.wileyspotlights.com)

**Download Spotlight apps in the following subject areas:**

Anthropology	Linguistics
Business	Philosophy
Economics	Politics & Government
Education	Psychology
Geography	Religion & Theology
History	Sociology



**WILEY**