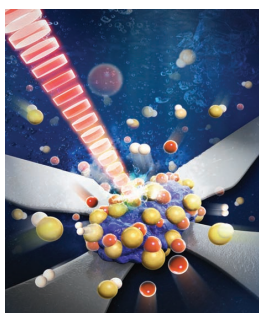


ADVANCED FUNCTIONAL MATERIALS

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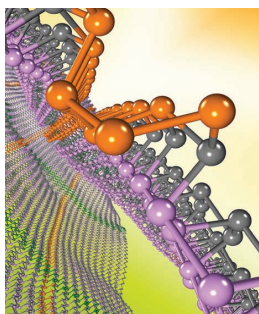
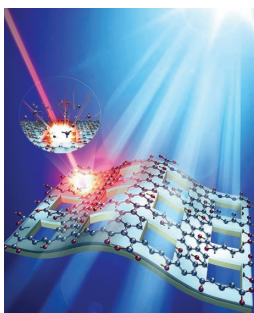


Hydrothermal Synthesis

On page 2222, K. Yu and team show that light absorption at the metal surface allows remote, localized generation of heat for enhanced chemical reaction rates only near the beam spot. A solution-processed photohydrothermal material synthesis via pulsed laser superheating of precursor solution takes advantage of such effects to enable ultra-fast and localized growth of functionalized metal oxide materials.

Photovoltaics

A facile, one step, roll-to-roll compatible laser patterning technique to improve and simultaneously tune the optoelectronic properties of graphene based transparent conductive electrodes (TCE) is demonstrated by E. Stratakis, E. Kymakis, and colleagues on page 2213. In order to overcome the trade-off between the sheet resistance and transparency, reduced graphene oxide micromeshes are laser-patterned on plastic substrate and incorporated in flexible organic photovoltaic devices as the TCE.

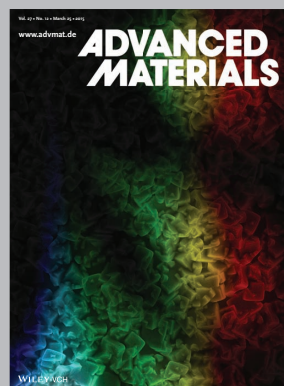
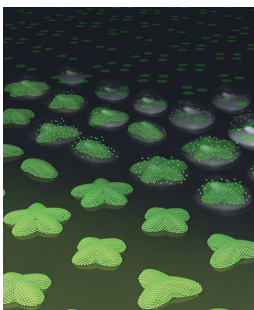


Phosphorene

Phosphorene, a new member of the 2D materials, is in the spotlight. On page 2230 G. Zhang, Y.-W. Zhang and co-workers report a strong phononic anisotropy, unusual anharmonicity, and large structural flexibility in mono- and few-layer phosphorenes, which indicate that phosphorenes are promising for fabricating novel acoustic and thermal devices.

Asymmetric Dewetting

On page 2237, Y. Song, F. Y. Li, and co-workers demonstrate a facile strategy to directly print controllable 3D structures and morphologies from one droplet. Through designing hydrophilic pattern on hydrophobic surface, the surface energy difference results in asymmetric retraction of the three phase contact line, which leads to various 3D structures. This idea to precisely print the 3D structures could open a new avenue for controllable 3D manufacture.



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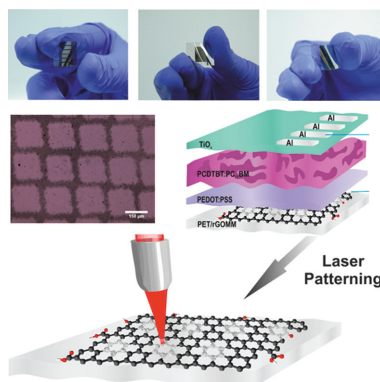
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FULL PAPERS

A direct laser writing technique is demonstrated for the fabrication of reduced graphene oxide micromesh electrodes with high conductivity and transparency. Their utilization as the transparent electrode in flexible organic photovoltaic (OPV) devices leads to a power conversion efficiency of 3.05%, which is the highest ever reported for flexible OPVs based on solution-processed graphene electrodes.



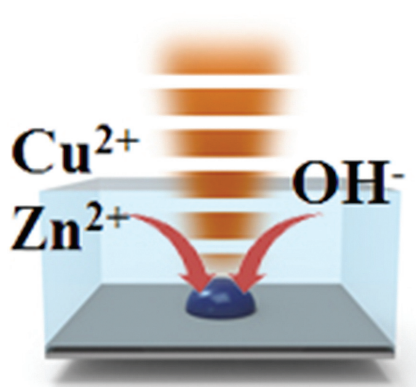
Photovoltaics

D. Konios, C. Petridis, G. Kakavelakis, M. Sygletou, K. Savva, E. Stratakis,* E. Kymakis*2213–2221

Reduced Graphene Oxide Micromesh Electrodes for Large Area, Flexible, Organic Photovoltaic Devices



Light absorption at metal surfaces allows remote, localized generation of heat for enhanced chemical reaction rates near the beam spot. A novel class of solution-processed metal-oxide synthesis techniques is demonstrated that takes advantage of these effects: photohydrothermal material synthesis via pulsed laser superheating of the precursor solution. This method allows ultrafast, localized, and facile growth of functionalized metal oxide materials on metal structures.

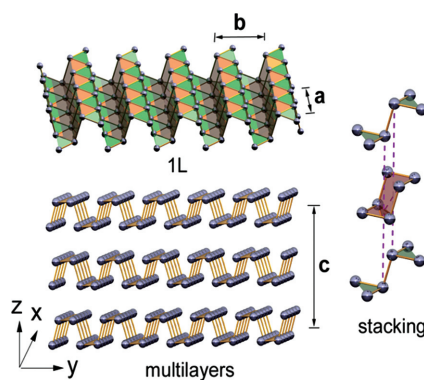


Hydrothermal Synthesis

K. Kwon, J. Shim, J. O. Lee, K. Choi, K. Yu*2222–2229

Localized Laser-Based Photohydrothermal Synthesis of Functionalized Metal-Oxides

Phosphorene, with a honeycomb lattice as graphene but puckered with ridge and accordion atomic profiles along the zigzag and armchair directions, shows a strong phonon anisotropy, and significant orientation-dependent interlayer coupling. Simulations reveal a more pronounced interlayer interaction and thermal leakage normal to the layer direction; accordingly, a different strategy is needed for thermal management of phosphorene devices.

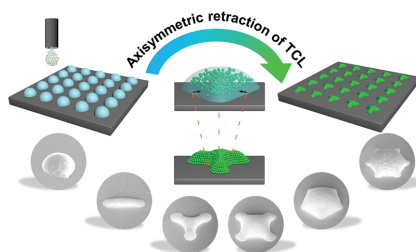


Phosphorene

Y. Cai, Q. Ke, G. Zhang,* Y. P. Feng, V. B. Shenoy, Y.-W. Zhang*2230–2236

Giant Phononic Anisotropy and Unusual Anharmonicity of Phosphorene: Interlayer Coupling and Strain Engineering

A facile strategy to directly print controllable 3D structures and morphologies from one single droplet is demonstrated. Through designing hydrophilic pattern on hydrophobic surface, the surface energy difference results in asymmetric retraction of three phase contact line, which leads to various 3D structures. This idea to precisely print the 3D structures will open a new avenue for controllable 3D manufacture.



Asymmetric Dewetting

L. Wu, Z. Dong, M. Kuang, Y. Li, F. Li,* L. Jiang, Y. Song*2237–2242

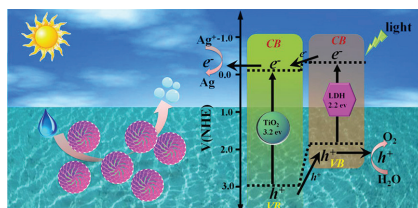
Printing Patterned Fine 3D Structures by Manipulating the Three Phase Contact Line

FULL PAPERS

Photocatalysis

Y. Dou, S. Zhang, T. Pan, S. Xu, A. Zhou,
M. Pu, H. Yan, J. Han,* M. Wei,*
D. G. Evans, X. Duan 2243–2249

**TiO₂@Layered Double Hydroxide
Core–Shell Nanospheres with Largely
Enhanced Photocatalytic Activity Toward
O₂ Generation**

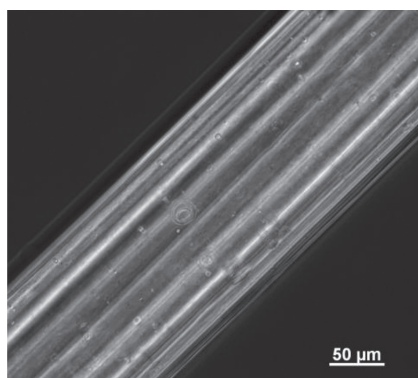


TiO₂@CoAl-layered double hydroxide (LDH) core–shell nanospheres are fabricated via hydrothermal synthesis of TiO₂ hollow nanospheres followed by in situ growth of CoAl-LDH shell, exhibiting an extraordinarily high photocatalytic activity toward oxygen evolution from water oxidation. A strong donor–acceptor coupling and suitable band matching between TiO₂ core and LDH shell facilitate the separation of photoinduced electron-hole pairs, accounting for the highly efficient photocatalytic performance.

Hydrogel Fibers

X. Shi, S. Ostrovidov, Y. Zhao,
X. Liang, M. Kasuya, K. Kurihara,
K. Nakajima, H. Bae, H. Wu,*
A. Khademhosseini* 2250–2259

**Microfluidic Spinning of Cell-Responsive
Grooved Microfibers**

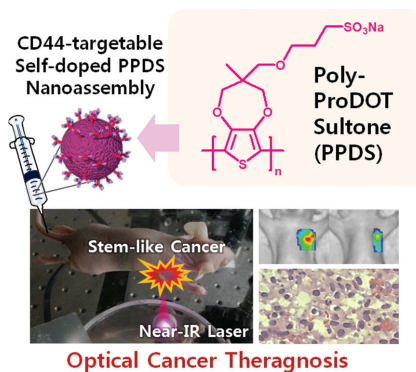


A photocrosslinkable microgrooved methacrylamide-modified gelatin (GelMA) fiber is produced via the use of a microfluidic device. The combination of the cell supportive properties of GelMA and the topographical cues allows improved cell-material interactions favoring anisotropic tissue formation. Moreover, the high hydration content and viscoelastic properties of the hydrogel allow the co-culturing cell types in and on the fiber.

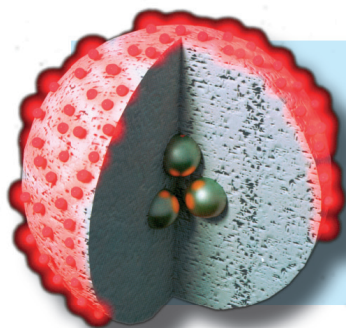
Optical Theragnosis

J. Kim, E. Lee, Y. Hong, B. Kim,
M. Ku, D. Heo, J. Choi, J. Na, J. You,
S. Haam, Y.-M. Huh, J.-S. Suh,* E. Kim,*
J. Yang* 2260–2269

**Self-Doped Conjugated Polymeric
Nanoassembly by Simplified Process
for Optical Cancer Theragnosis**



A thiophene-based photothermal (PT) organic nanoprobe is synthesized, with a simplified preparation process not requiring PEGylation or multicoating. The synthesized nanoassembly shows good stability, biocompatibility, and PT properties. The nanoassembly is applied to 3D tumor mammospheres and breast cancer, and shows excellent specific targeting of the CD44-expressing cancerous cells, near-infrared (NIR) absorbance imaging in vivo, and effective damaging by NIR light irradiation.



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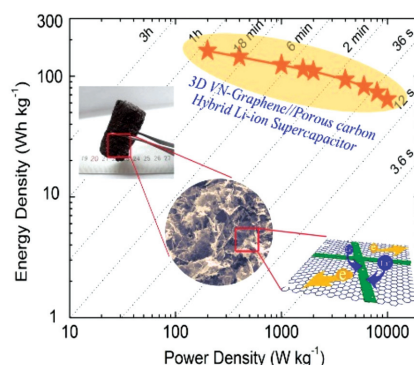
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FULL PAPERS

A 3D porous VN nanowires–graphene composite is proved to be a pseudo-capacitive material with the fast and large Li-ion storage characteristics. Such superior composite anode coupling with a capacitance-type porous carbon cathode is able to assemble a novel hybrid Li-ion capacitor with an ultrahigh energy density of 162 Wh kg^{-1} and good rate performance.

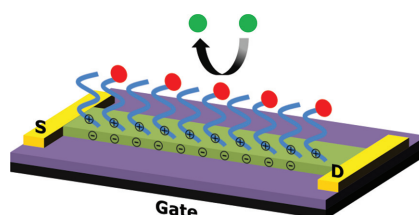


Supercapacitors

R. Wang, J. Lang, P. Zhang, Z. Lin, X. Yan*2270–2278

Fast and Large Lithium Storage in 3D Porous VN Nanowires–Graphene Composite as a Superior Anode Toward High-Performance Hybrid Supercapacitors

Functionalized polyelectrolytes are successfully synthesized and assembled on silicon nanowire field effect transistors with the aim of creating regenerative nano-electronic biosensors. Such coating has the advantage of direct solution coating and can be applied on a wafer scale. It minimizes protein nonspecific adsorption and precisely controls the surface functional group densities at molecular level.

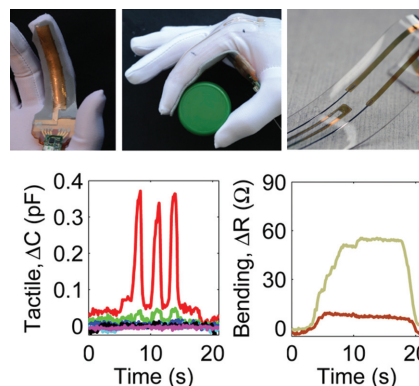


Biosensors

X. Duan,* L. Mu, S. D. Sawtelle, N. K. Rajan, Z. Han, Y. Wang, H. Qu, M. A. Reed2279–2286

Functionalized Polyelectrolytes Assembling on Nano-BioFETs for Biosensing Applications

A multimodal electronic skin including resistive sensors for monitoring finger articulation and capacitive tactile pressure sensors is reported. Pressure sensitivity across much of the range of human physiological sensing is achieved by implementing soft, compressible silicone foam and stretchable thin metal films. A sensorized glove is implemented in a human-in-the-loop system for controlling the grasp of objects.

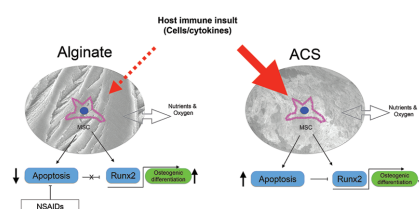


Wearables

A. P. Gerratt, H. O. Michaud, S. P. Lacour*2287–2295

Elastomeric Electronic Skin for Prosthetic Tactile Sensation

The encapsulating hydrogel biomaterials, especially in the early stages of implantation, can regulate the mesenchymal stem cell–host immune system interplay and modulate the fate of the encapsulated stem cells. A new strategy is reported for enhanced bone regeneration in mesenchymal stem cell-mediated therapies based on an RGD-coupled alginate hydrogel coencapsulation system containing an anti-inflammatory drug.



Stem Cells

A. Moshaverinia,* C. Chen, X. Xu, S. Ansari, H. H. Zadeh, S. R. Schricker, M. L. Paine, J. Moradian-Oldak, A. Khademhosseini, M. L. Snead, S. Shi*2296–2307

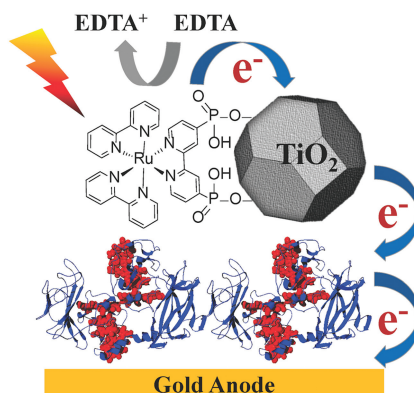
Regulation of the Stem Cell–Host Immune System Interplay Using Hydrogel Coencapsulation System with an Anti-Inflammatory Drug

FULL PAPERS

Photoelectrochemistry

E. T. Hwang, K. Sheikh, K. L. Orchard,
D. Hojo,* V. Radu, C.-Y. Lee,
E. Ainsworth, C. Lockwood, M. A. Gross,
T. Adschiri, E. Reisner,* J. N. Butt,*
L. J. C. Jeuken* 2308–2315

A Decaheme Cytochrome as a Molecular Electron Conduit in Dye-Sensitized Photoanodes

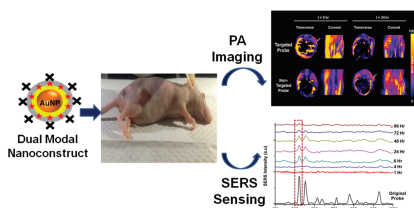


A molecular electron conduit of the decaheme cytochrome, MtrC, interfacing dye-sensitized TiO_2 nanocrystals to an electrode support is assembled and demonstrated. The constructed layers of MtrC and TiO_2 nanocrystals photosensitized with RuP are used in a biomimetic hybrid photobiochemical system with the aim to mimic the efficient spatial charge separation found in biological photosystems.

Nanoconstructs

U. S. Dinish, Z. Song, C. J. H. Ho,
G. Balasundaram, A. B. E. Attia,
X. Lu, B. Z. Tang,* B. Liu,*
M. Olivo* 2316–2325

Single Molecule with Dual Function on Nanogold: Biofunctionalized Construct for In Vivo Photoacoustic Imaging and SERS Biosensing

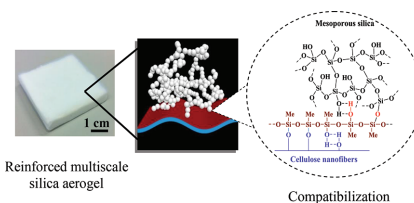


A group of NIR active organic molecules are designed and synthesized that possess both surface-enhanced Raman scattering (SERS) and photoacoustic (PA) activity simultaneously. The complementary dual functional ability of the nanoconstruct realized by anchoring such molecules onto gold nanoparticles is used for the targeted detection and imaging of cancer biomarker and also for a biodistribution study using PA imaging and SERS biosensing in tandem.

Nanoscale Scaffolds

S. Zhao, Z. Zhang, G. Sèbe, R. Wu,
R. V. Rivera Virtudazo, P. Tingaut,*
M. M. Koebel* 2326–2334

Multiscale Assembly of Superinsulating Silica Aerogels Within Silylated Nanocellulosic Scaffolds: Improved Mechanical Properties Promoted by Nanoscale Chemical Compatibilization

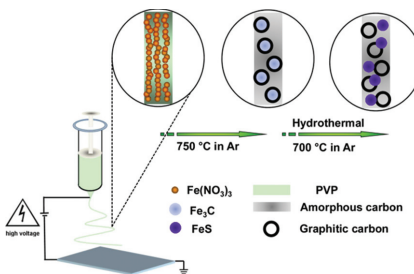


A strong multiscale silica aerogel is obtained through the interpenetration of silica nanoparticles with a silylated nanocellulosic scaffold. The polysiloxane layer decorating the scaffold is exploited to promote the attachment of the mesoporous silica matrix onto the nanofibrillated cellulose scaffold, leading to highly porous silica hybrid aerogel displaying reduced linear shrinkage, improved compressive properties but maintaining its superinsulating properties.

Nanowires

C. Zhu, Y. Wen, P. A. van Aken,
J. Maier, Y. Yu* 2335–2342

High Lithium Storage Performance of FeS Nanodots in Porous Graphitic Carbon Nanowires



FeS nanodots accommodated in porous graphitic carbon nanowires are obtained via the combination of electrospinning technique and a biomolecular-assisted hydrothermal method. These materials exhibit excellent electrochemical performances as cathode materials. Key problems of conversion reaction, such as the low degree of reversibility and large polarization, are far-reachingly mitigated.