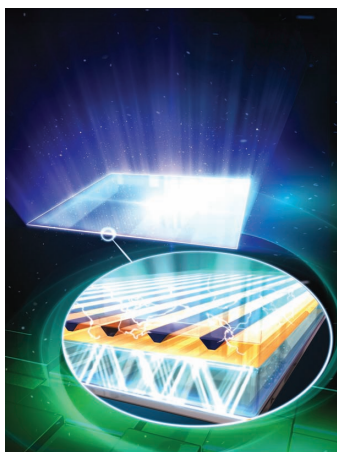


ADVANCED FUNCTIONAL MATERIALS

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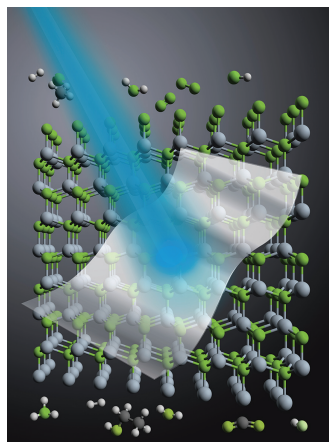
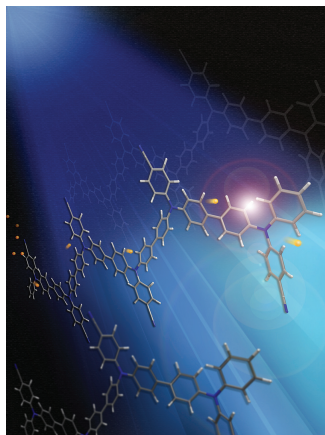


Organic Electronics

An invisible nanosized stripe auxiliary electrode layer (nSAEL) for OLEDs that can avoid the shortcomings of conventional microsized layers while maintaining high optical uniformity due to the improved conductivity of the electrode is proposed by Y. W. Park, B.-K. Ju, and co-workers on page 6414. An additional advantage is that the structure of the nSAEL increases light extraction by utilizing the microcavity (MC) effect and the outcoupled surface plasmon polariton (SPP) mode.

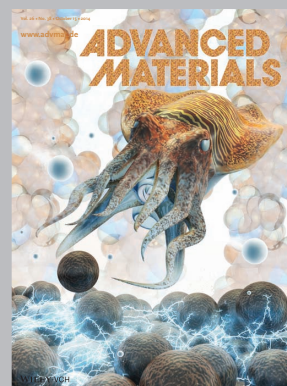
Fluorescence

On page 6422, J.-H. Wu and G.-S. Liou demonstrate high-performance electrofluorochromic (EFC) devices using poly(4-cyanotriphenylamine) (CN-PTPA) with photoluminescent quantum yield of 21.9% as active layer. These reveal rapid response time less than 0.4 s, excellent EFC stability longer than 9000 s, and the highest fluorescence contrast ratio ($I_{\text{off}}/I_{\text{on}}$) of 242 from neutral state to a non-fluorescent oxidized state to the best of our knowledge.



Nanomembranes

Using a special electrochemical procedure, J. Han and colleagues succeed in slicing off Gallium nitride from a thick and rigid structure into a form of nanomembrane (NM) with a thickness of only hundreds of atomic layers. The NMs presented on page 6503 possess a very favorable transport property, while its two surfaces (top and bottom) present both opportunities and challenges for new applications.



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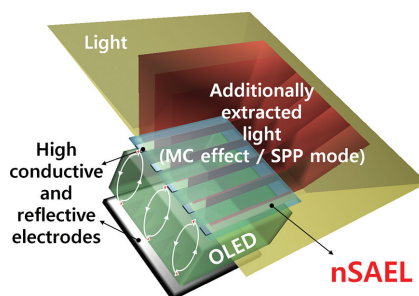
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FULL PAPERS

Organic Electronics

Y. S. Shim, J. H. Hwang, H. J. Lee,
K. B. Choi, K. N. Kim, C. H. Park,
S.-G. Jung, Y. W. Park,*
B.-K. Ju* 6414–6421

Nanoshuttered OLEDs: Unveiled Invisible Auxiliary Electrode

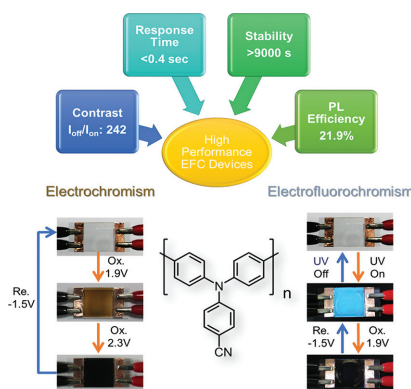


An invisible nanosized stripe auxiliary electrode layer (nSAEL) for OLEDs that can avoid the shortcomings of conventional microsized layers while maintaining high optical uniformity due to the improved conductivity of the electrode is proposed. An additional advantage is that the structure of the nSAEL increases light extraction by utilizing the microcavity (MC) effect and the outcoupled surface plasmon polariton (SPP) mode.

Fluorescence

J.-H. Wu, G.-S. Liou* 6422–6429

High-Performance Electrofluorochromic Devices Based on Electrochromism and Photoluminescence-Active Novel Poly(4-Cyanotriphenylamine)

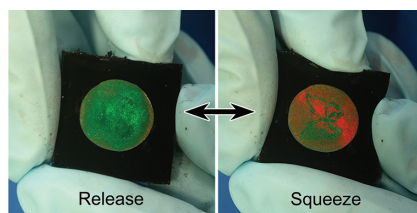


A high-performance electrofluorochromic (EFC) device of poly(4-cyanotriphenylamine)(CN-PTPA) as active layer is readily fabricated and exhibits high photoluminescent (PL) quantum yield of 21.9% in film state, high PL contrast ratio ($I_{\text{off}}/I_{\text{on}}$) of 242 from a fluorescent neutral state to a non-fluorescent oxidized state, rapid response time less than 0.4 s, and excellent EFC stability longer than 9000 s.

Photonic Crystals

S. Y. Ye, Q. Q. Fu, J. P. Ge* ... 6430–6438

Invisible Photonic Prints Shown by Deformation

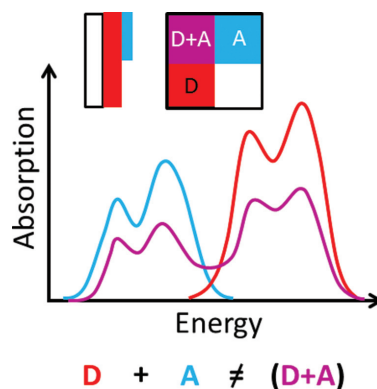


An effective photonic printing method is developed to create patterns and background with very close photonic structures but different mechanochromic capabilities, so that the invisible photonic patterns in relaxed state can be revealed under deformation due to the nonuniform change in photonic structure. The patterns can be instantly and reversibly shown or hidden for many times, which could be a useful encryption or antifraud material in daily life.

Solar Cells

C. Schwarz, F. Milan, T. Hahn,
M. Reichenberger, S. Kümmel,
A. Köhler* 6439–6448

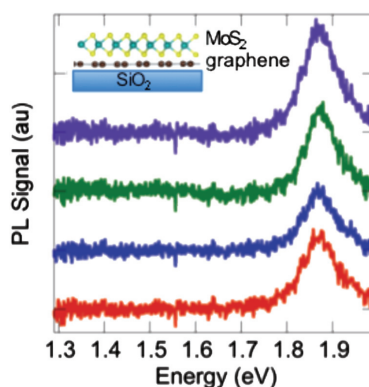
Ground State Bleaching at Donor–Acceptor Interfaces



Charge separation at the donor–acceptor interface in organic solar cells may be assisted by interfacial charge transfer type complexes that prevail already in the ground state. In bilayer solar cells, a reduced absorption that correlates with solar cell efficiency is observed and attributed to the formation of interfacial ground state charge transfer complexes.

FULL PAPERS

Two-dimensional heterostructures composed of monolayer MoS₂ on graphene are synthesized using chemical vapor deposition. Large-area, continuous, and uniform MoS₂ monolayers are grown directly on graphene, resulting in heterostructure samples on the centimeter scale with the possibility for even larger lateral dimensions. Atomic force microscopy, photoluminescence, X-ray photoelectron, and Raman spectroscopies demonstrate uniform single-layer growth of stoichiometric MoS₂.

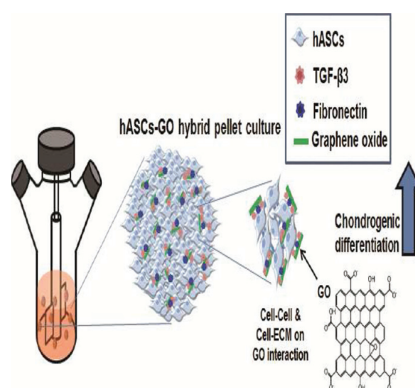


Graphene

K. M. McCreary,* A. T. Hanbicki, J. T. Robinson, E. Cobas, J. C. Culbertson, A. L. Friedman, G. G. Jernigan, B. T. Jonker* ...6449–6454

Large-Area Synthesis of Continuous and Uniform MoS₂ Monolayer Films on Graphene

Graphene oxide can be used as both a cell-adhesion substrate and a growth factor delivery carrier for the chondrogenic differentiation of adult stem cells.

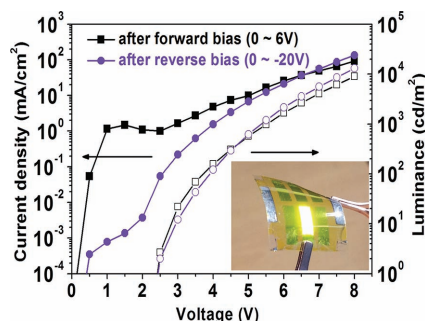


Graphene Oxide

H. H. Yoon, S. H. Bhang, T. Kim, T. Yu, T. Hyeon, B.-S. Kim*6455–6464

Dual Roles of Graphene Oxide in Chondrogenic Differentiation of Adult Stem Cells: Cell-Adhesion Substrate and Growth Factor-Delivery Carrier

Highly emissive and flexible polymer light-emitting diodes (PLEDs) based on silver nanowire (AgNW) electrodes with improved operational stability is demonstrated. Fluctuating features of leakage current become stabilized and the device performance is improved in the resulted PLEDs after simply running the devices once in reverse bias. Works to examine the morphological change of AgNW film are conducted in this work.

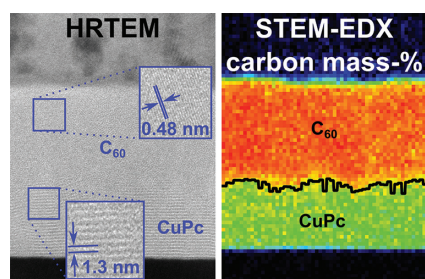


Organic Electronics

Y. Lee, M. Suh, D. Kim, D. Lee, H. Chang, H. S. Lee, Y. W. Kim, T. Y. Kim, K. S. Suh, D. Y. Jeon*6465–6472

Improved Operational Stability of Polymer Light-Emitting Diodes Based on Silver Nanowire Electrode Through Pre-Bias Conditioning Treatment

The local structure and composition within a photovoltaic assembly based on copper phthalocyanine (CuPc) and C₆₀ is resolved using high resolution transmission electron microscopy. A methodology to prepare cross-sections with minimum damage is presented. Energy dispersive X-ray spectroscopy in combination with scanning transmission electron microscopy unambiguously identifies the interfaces by mapping the chemical composition.



Organic Electronics

J. B. Gilchrist, T. H. Baisey-Fisher, S. C'E. Chang, F. Scheltens, D. W. McComb,* S. Heutz* ...6473–6483

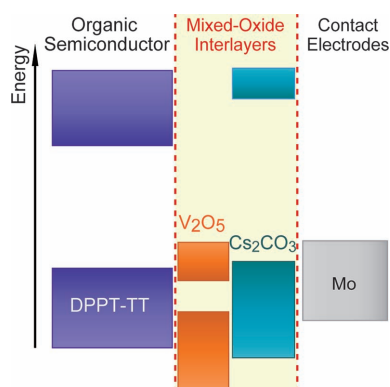
Uncovering Buried Structure and Interfaces in Molecular Photovoltaics

FULL PAPERS

Soft Electronics

D. X. Long, K.-J. Baeg, Y. Xu, S.-J. Kang,
M.-G. Kim, G.-W. Lee,
Y.-Y. Noh* 6484–6491

Gradual Controlling the Work Function of Metal Electrodes by Solution-Processed Mixed Interlayers for Ambipolar Polymer Field-Effect Transistors and Circuits

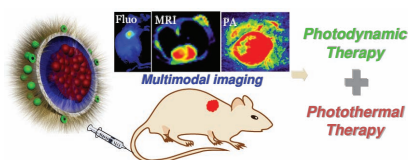


A gradual control of the metal electrode's work function (Φ) by incorporating solution-processed mixed contact interlayer of transition metal salts (Cs_2CO_3 and V_2O_5). Low-cost Mo electrode with $\Phi = 4.5$ eV is finely modulated between 4.2 eV and 4.8 eV by controlling mixed concentration, which are used as common source/drain electrodes in high-mobility ambipolar polymer semiconductor OFETs and complementary-like inverter circuit.

Cancer Theranostics

H. Gong, Z. L. Dong, Y. M. Liu, S. Yin,
L. Cheng, W. Y. Xi, J. Xiang, K. Liu,
Y. G. Li, Z. Liu* 6492–6502

Engineering of Multifunctional Nano-Micelles for Combined Photothermal and Photodynamic Therapy Under the Guidance of Multimodal Imaging

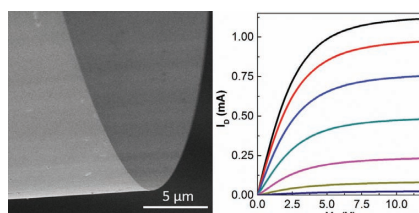


Multifunctional polymeric nano-micelles containing a photosensitizer, which at the same time serves as a chelating agent for Gd(III), together with a near-infrared absorbing dye, are fabricated. Utilizing these theranostic nano-micelles, combined photothermal and photodynamic therapy, which is guided under triple-modal magnetic resonance, fluorescence, and photoacoustic imaging, is conducted, achieving a synergistic anti-tumor effect in a mouse model.

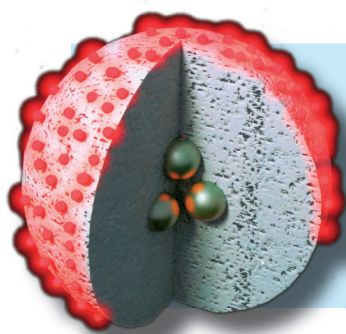
Nanomembranes

K. Xiong, S. H. Park, J. Song, G. Yuan,
D. Chen, B. Leung, J. Han* ... 6503–6508

Single Crystal Gallium Nitride Nanomembrane Photoconductor and Field Effect Transistor



Large-area, free-standing and single-crystalline GaN nanomembranes with an excellent electron mobility are prepared by electrochemical etching from epitaxial layers. The interaction of carriers with surface states is investigated by UV-assisted Hall measurement and photoconductance. Normally-off enhancement-type GaN nanomembrane MOS transistors are demonstrated, suggesting that GaN could be used in flexible electronics for high power and high frequency applications.



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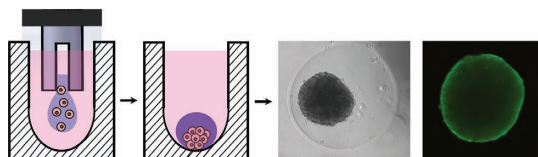
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FULL PAPERS

Utilizing polymeric aqueous two-phase systems, an aqueous drop containing cancer cells within an immiscible, immersion aqueous phase is microprinted to facilitate aggregation of cells into a viable tumor spheroid, and the utility of this approach is demonstrated for high throughput, quantitative drug screening with 3D cultures of cells.

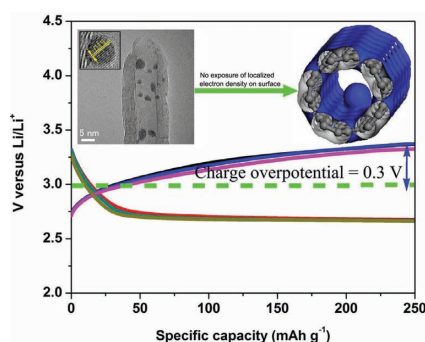


Drug Screening

E. Atefi, S. Lemmo, D. Fyffe, G. D. Luker, H. Tavana*6509–6515

High Throughput, Polymeric Aqueous Two-Phase Printing of Tumor Spheroids

Encapsulation of noble metal nanoparticles significantly strengthens the surface electron density of carbon nanotubes (CNTs) without causing regional enrichment of electron density on CNT surface. Accordingly, the entire surfaces of CNTs serve as catalytic regions for the oxygen reduction reaction (ORR), which ensures uniform covering of Li_2O_2 nanocrystals on the CNT surface, thus facilitating the decomposition of Li_2O_2 with low charge overpotential.

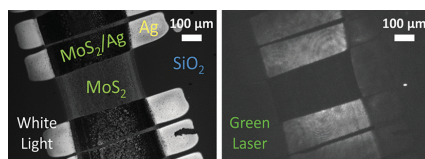


Cathode Materials

X. Huang,* H. Yu, H. Tan, J. Zhu, W. Zhang, C. Wang, J. Zhang, Y. Wang, Y. Lv, Z. Zeng, D. Liu, J. Ding, Q. Zhang, M. Srinivasan, P. M. Ajayan, H. H. Hng,* Q. Yan*6516–6523

Carbon Nanotube-Encapsulated Noble Metal Nanoparticle Hybrid as a Cathode Material for Li-Oxygen Batteries

An efficient inkjet printing technology is developed for direct and reliable writing of uniform patterns of high-quality MoS_2 nanosheets at a resolution of tens of micrometers. It provides a facile method for massive and cost-effective production of a variety of electronic and photonic devices, such as thin film transistors, photoluminescence patterns, and photodetectors.

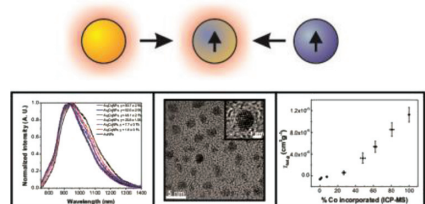


Inkjet Technology

J. Li, M. M. Naiini, S. Vaziri, M. C. Lemme, M. Östling*6524–6531

Inkjet Printing of MoS_2

The synthesis of gold-cobalt nanoparticle alloys with tunable magnetic susceptibility and near-infrared emission is presented. The particles are synthesized in water at room temperature and exhibit compositions ranging from 0–100% Co, while maintaining the same size and surface chemistry. This is in contrast to bulk behavior, where Au and Co exhibit no miscibility across all composition space below 400 °C.



Nanoparticle Alloys

L. E. Marbella, C. M. Andolina, A. M. Smith, M. J. Hartmann, A. C. Dewar, K. A. Johnston, O. H. Daly, J. E. Millstone*6532–6539

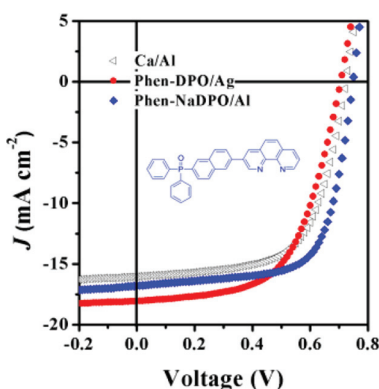
Gold-Cobalt Nanoparticle Alloys Exhibiting Tunable Compositions, Near-Infrared Emission, and High T_2 Relaxivity

FULL PAPERS

Organic Electronics

W.-Y. Tan, R. Wang, M. Li, G. Liu,
P. Chen, X.-C. Li, S.-M. Lu, H. L. Zhu,
Q.-M. Peng, X.-H. Zhu,* W. Chen,*
W. C. H. Choy,* F. Li,* J. B. Peng,
Y. Cao 6540–6547

Lending Triarylphosphine Oxide to Phenanthroline: a Facile Approach to High-Performance Organic Small-Molecule Cathode Interfacial Material for Organic Photovoltaics utilizing Air-Stable Cathodes

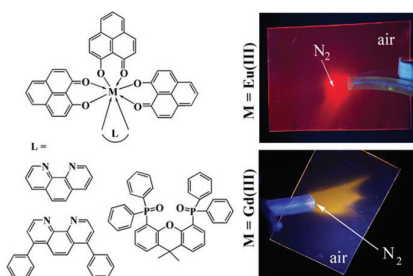


The organic molecule **Phen-NaDPO** that possesses characteristics of a facile synthesis/purification, a high T_g , and attractive electron transport, is successfully shown as a promising cathode interlayer to improve the PCE. Consequently, a PCE of 7.5% and 8.56% is reported respectively for Phen-NaDPO/Ag and Phen-NaDPO/Al devices utilizing PTB7:PC₇₁BM active layer, which compares well with that of the Ca/Al device.

Luminescence

S. M. Borisov,* R. Fischer, R. Saf,
I. Klimant 6548–6560

Exceptional Oxygen Sensing Properties of New Blue Light-Excitable Highly Luminescent Europium(III) and Gadolinium(III) Complexes



New Eu(III) and Gd(III) complexes combine efficient excitation with blue light, strong emission, and efficient oxygen quenching capabilities. They are used in advanced oxygen sensing materials including planar optodes and nanosensors.