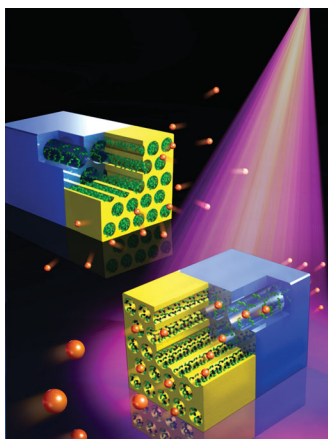


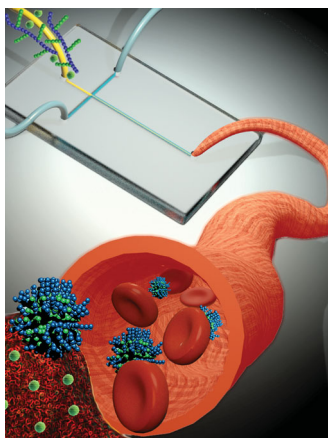
ADVANCED FUNCTIONAL MATERIALS

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Ion Gating

Artificial heterogeneous nanochannels with light-responsive ion transport properties are demonstrated by Z. Liu, J. Zhai, and co-workers on page 424. Their fabrication includes coating an anatase TiO₂ porous layer onto an alumina porous supporter, followed by chemical modification with octadecyltrimethoxysilane (OTS) molecules. The decomposition of OTS molecules by TiO₂ photo-catalysis under UV light contributes to a change of surface wettability and an asymmetric distribution of surface negative charges, which realize the ion gating and regulatable ion rectification characteristics simultaneously.

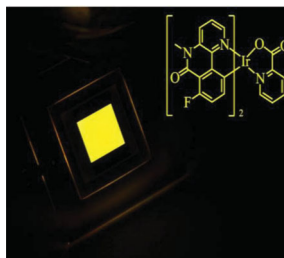


Drug Delivery

The use of solvent-free microfluidics to fine-tune the physical and chemical properties of chitosan nanoparticles for drug delivery is demonstrated by J. J. VanDersarl, P. Renaud, and co-workers on page 432. Controlling the time of mixing to within milliseconds during nanoparticle self-assembly enables the adjustment of nanoparticle size, surface charge, and compactness, as well as drug-loading efficiency. These drug-loaded nanoparticles can be passively targeted to tumors, benefiting from enhanced permeability and retention, along with pH-responsive release characteristics.

Organic Light-Emitting Diodes

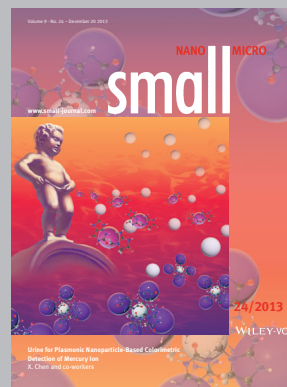
On page 555, J.-H. Jou et al. present a highly efficient, iridium-based, yellow emitter with both dry- and wet-processability. The yellow organic LED device exhibits, at 1000 cd m⁻², an efficacy of 75 lm W⁻¹ via evaporation deposition, the highest among all reported dry-processed yellow OLEDs, and 52 lm W⁻¹ via spin-coating, the highest among all wet-processed counterparts.



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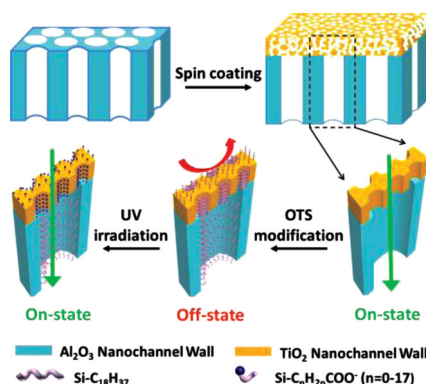
www.small-journal.com

FULL PAPERS

Ion Gating

Q. Zhang, Z. Hu, Z. Liu,* J. Zhai,*
L. Jiang 424–431

**Light-Gating Titania/Alumina
Heterogeneous Nanochannels
with Regulatable Ion Rectification
Characteristic**

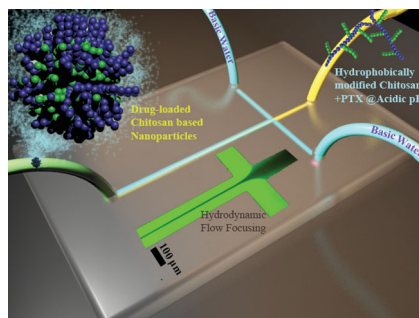


Artificial nanochannels based on chemically modified $\text{TiO}_2/\text{Al}_2\text{O}_3$ heterogeneous porous membranes are described. The irreversible decomposition of octadecyltrimethoxysilane (OTS) molecules by TiO_2 photocatalysis under ultraviolet light results in a change of surface wettability and an asymmetric distribution of surface negative charges simultaneously, which contributes to the ion gating and regulatable ion rectification.

Drug Delivery

F. S. Majedi, M. M. Hasani-Sadrabadi,
J. J. VanDersarl,* N. Mokarram,
S. Hojjati-Emami, E. Dashtimoghdam,
S. Bonakdar, M. A. Shokrgozar,
A. Bertsch, P. Renaud* 432–441

**On-Chip Fabrication of Paclitaxel-
Loaded Chitosan Nanoparticles for
Cancer Therapeutics**

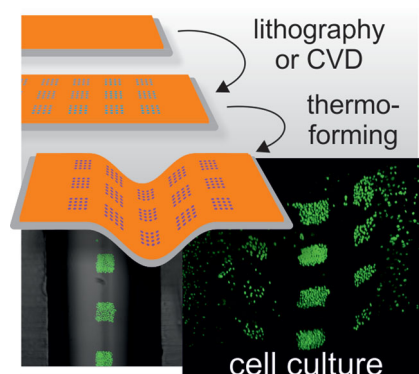


Using microfluidics to precisely regulate self-assembly conditions, a number of nanoparticle properties are tuned to optimize drug-delivery efficacy. These parameters include size, zeta potential, and pH responsiveness. These nanoparticles are stable during circulation at physiological pH, but if they encounter a tumor cell, where the pH is lower, they rapidly release their anti-cancer drug cargo.

Micropatterning

B. Waterkotte, F. Bally,
P. M. Nikolov, A. Waldbaur,
B. E. Rapp, R. Truckenmüller, J. Lahann,
K. Schmitz,* S. Giselbrecht* ... 442–450

**Biofunctional Micropatterning of
Thermoformed 3D Substrates**



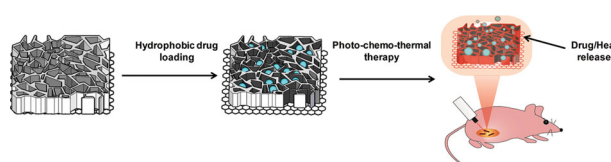
Chemical vapor deposition polymerization and maskless projection lithography with protein adsorption by photobleaching (MPL-PAP) in combination with micro-scale thermoforming are presented as two versatile technologies to create patterned biofunctionalized 3D substrates. These technologies provide new perspectives for bioanalytical applications and 3D cell culture platforms.

Nanostructures

Y.-W. Chen, P.-J. Chen, S.-H. Hu,
I.-W. Chen, S.-Y. Chen* 451–459

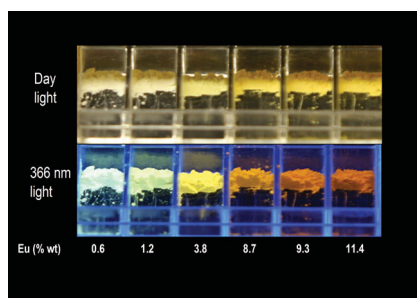
**NIR-Triggered Synergic Photo-
chemothermal Therapy Delivered by
Reduced Graphene Oxide/Carbon/
Mesoporous Silica Nanocookies**

Formed by a one-pot, scalable emulsion method and triggered by near infrared irradiation, photosensitive nanoparticles with a silica/carbon nanostructure supported on a reduced graphene oxide substrate can control release of hydrophobic chemotherapy drugs with synergistic hyperthermia effects, eradicating tumor cells in vivo and in vitro on demand.



FULL PAPERS

An amorphous $\text{Si}_3\text{B}_3\text{N}_7$ network serves as a universal host for various activator ions to be used as inorganic phosphors, particularly for LED-based lighting devices. This solution-based synthesis route provides significant advantages, e.g., tuning the emission color of the phosphors via codoping with more than one activator ion in high purity and homogeneity.

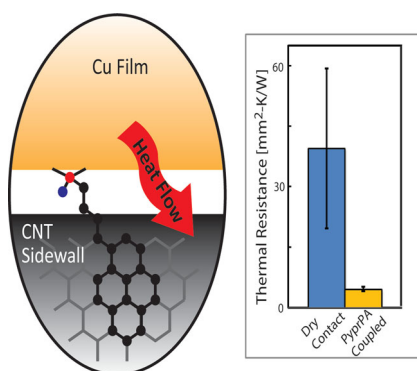


Ceramics

H. Cakmak, M. Jansen*460–464

Amorphous $\text{Si}_3\text{B}_3\text{N}_7$ Ceramic as a Versatile Host for Inorganic Phosphor Activators

A pyrenylpropyl phosphonic acid surface modifier is developed for coupling carbon nanotubes to metal oxide surfaces to reduce the thermal contact resistance. The modifier is demonstrated through experiment to reduce the thermal contact resistance between vertically aligned carbon nanotube forests and Cu oxide surfaces by roughly 9-fold, enabling carbon nanotube-based thermal interface materials with thermal resistances comparable to conventional metallic solders.

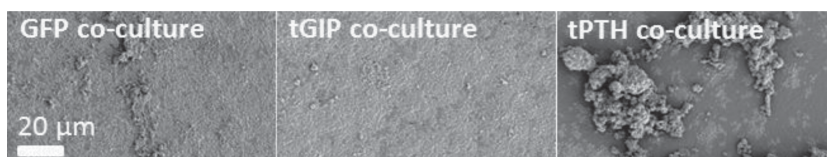


Carbon Nanotubes

J. H. Taphouse, O. L. Smith,
S. R. Marder,* B. A. Cola*465–471

A Pyrenylpropyl Phosphonic Acid Surface Modifier for Mitigating the Thermal Resistance of Carbon Nanotube Contacts

A method for modulating bone remodeling by osteoblasts and osteoclasts using cell-tethered parathyroid hormone (tPTH) and glucose-dependent insulinotropic peptide (tGIP) is described. Cell-modified silk film biomaterial surfaces are reconstructed from scanning electron microscope images into three-dimensional surface models using image processing for quantitative measurement of surface characteristics. tPTH increases remodeled surface roughness while tGIP has the opposite effect.

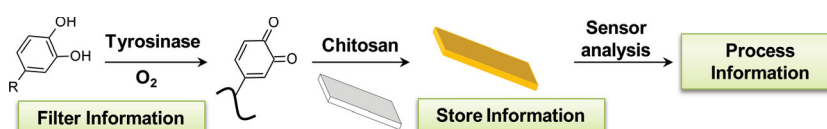


Tissue Engineering

R. S. Hayden, J.-P. Fortin, B. Harwood,
B. Subramanian, K. P. Quinn,
I. Georgakoudi, A. S. Kopin,
D. L. Kaplan*472–479

Cell-Tethered Ligands Modulate Bone Remodeling by Osteoblasts and Osteoclasts

An enzyme is used to “filter” chemical information and write this information to a hydrogel film, which then serves as a permanent storage medium that can be ‘read’ repeatedly, interactively, and by multiple sensor modalities. Potentially, this approach will be applicable for problems such as analysis of the health benefits of dietary phenols.



Bioelectronics

Y. Liu, E. Kim, M. E. Lee, B. Zhang,
Y. A. Elabd, Q. Wang, I. M. White,
W. E. Bentley, G. F. Payne*480–491

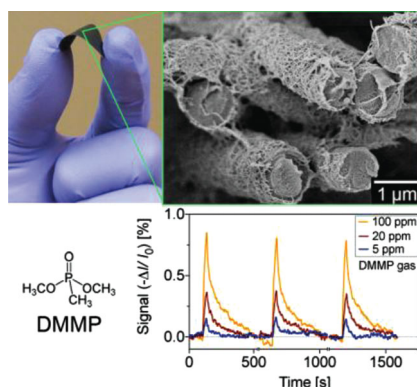
Enzymatic Writing to Soft Films: Potential to Filter, Store, and Analyze Biologically Relevant Chemical Information

FULL PAPERS

Flexible Sensors

K. Saetia, J. M. Schnorr, M. M. Mannarino, S. Y. Kim, G. C. Rutledge, T. M. Swager, P. T. Hammond*492–502

Spray-Layer-by-Layer Carbon Nanotube/Electrospun Fiber Electrodes for Flexible Chemiresistive Sensor Applications

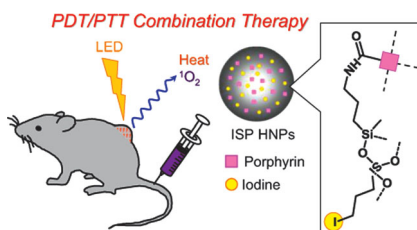


Flexible sensory material based on con-formal multi-walled carbon nanotube (MWNT) films on a porous electrospun-polymeric fiber mat is constructed using a vacuum-assisted spray layer-by-layer assembly. The resulting thin MWNT films coat individual electrospun fibers with controlled loading and electrical conductivity. The MWNT/electrospun fiber electrodes display reversible responses and high sensitivity for detecting DMMP in aqueous and vapor phases.

Theranostics

K. Hayashi,* M. Nakamura, H. Miki, S. Ozaki, M. Abe, T. Matsumoto, T. Kori, K. Ishimura503–513

Photostable Iodinated Silica/Porphyrin Hybrid Nanoparticles with Heavy-Atom Effect for Wide-Field Photodynamic/Photothermal Therapy Using Single Light Source

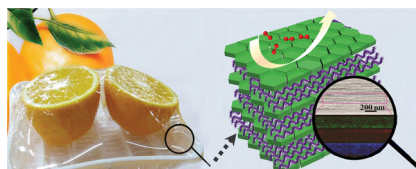


Photodynamic/photothermal combination therapy using iodinated silica/porphyrin hybrid nanoparticles (ISP HNPs) inhibits tumor growth. The ISP HNPs have high photostability, and they efficiently generate both $^1\text{O}_2$ and heat with irradiation from an LED because of the external heavy-atom effect. The surface-modified ISP HNPs accumulate in tumor tissue. Light irradiation to the tumor leads to the death of tumor cells.

Oxygen Barriers

Y. Dou, S. Xu, X. Liu, J. Han, H. Yan, M. Wei,* D. G. Evans, X. Duan...514–521

Transparent, Flexible Films Based on Layered Double Hydroxide/Cellulose Acetate with Excellent Oxygen Barrier Property

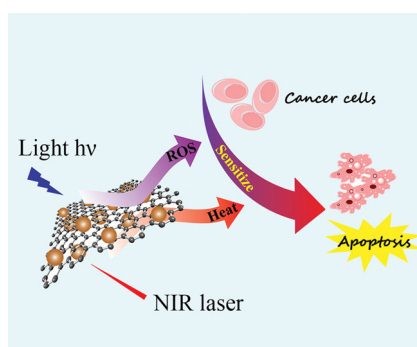


Transparent, flexible films with excellent oxygen barrier behavior are fabricated by spin-coating of cellulose acetate (CA) and layered double hydroxide (LDH) nanoplatelets alternately, followed by thermal annealing treatment. The resulting (CA/LDH)₂₀ film exhibits extraordinarily enhanced oxygen barrier property, superior to the previously reported inorganic-filled films.

Theranostics

Z. Chen, Z. Li, J. Wang, E. Ju, L. Zhou, J. Ren,* X. Qu*522–529

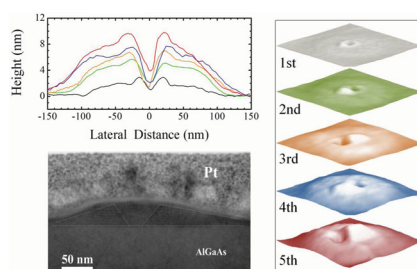
A Multi-synergistic Platform for Sequential Irradiation-Activated High-Performance Apoptotic Cancer Therapy



With the aid of sequential irradiation, highly integrated reduced graphene oxide–ZnO nanoparticle–hyaluronic acid nanoassemblies can serve as a multi-synergistic platform for targeted high-performance apoptotic cancer therapy. The reactive oxygen species generated by ZnO/rGo under light irradiation can effectively sensitize cancer cells to the subsequent NIR laser-induced apoptotic hyperthermia.

FULL PAPERS

The nanodroplets preferably form on pre-existing nanorings, which enables fabrication of vertically aligned nanostructures by droplet epitaxy. Nucleation thermodynamics and growth kinetics are proposed to explain the vertically correlated droplet epitaxy. Heterojunctions can be realized at the nanoscale by this method. In addition, the nucleation thermodynamics of these nanodroplets will allow site-controlled fabrication of nanostructures.

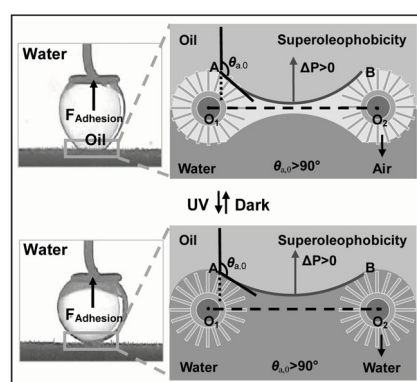


Nanorings

J. Wu, Y. Hirono, X. Li, Z. M. Wang,*
J. Lee, M. Benamara, S. Luo, Y. I. Mazur,
E. S. Kim, G. J. Salamo530–535

Self-Assembly of Multiple Stacked Nanorings by Vertically Correlated Droplet Epitaxy

Phototunable oil adhesion underwater on micro/nanoscale hierarchical structured ZnO mesh films with switchable contact mode between UV irradiation and storage in the dark is demonstrated. This work is promising for photocontrollable underwater oil adhesion, and may also provide interesting insight into the design of novel materials and functional devices based on the controllable adhesion of oil at surfaces.

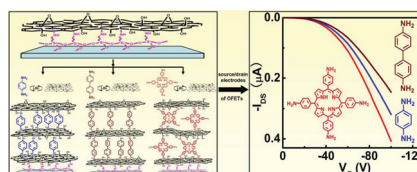


Oil Adhesion

D. Tian,* Z. Guo, Y. Wang, W. Li,
X. Zhang,* J. Zhai,*
L. Jiang536–542

Phototunable Underwater Oil Adhesion of Micro/Nanoscale Hierarchical-Structured ZnO Mesh Films with Switchable Contact Mode

Graphene-based ultrathin films simultaneously featured with tunable performance, controlled thickness, and high stability, are integrated using π -conjugated molecules as cross-linkages. The use of dual functional linkage endows our new protocol with broad opportunities for desired motives in terms of using elaborately-designed linkages of desired functions.

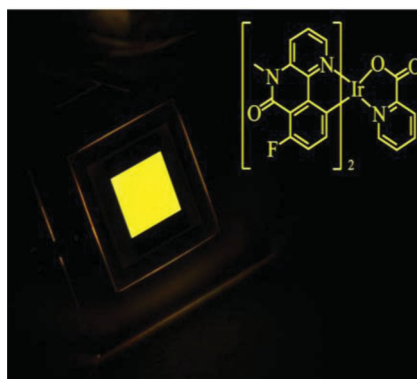


Organic Electronics

X. Ou, P. Chen,* L. Jiang, Y. Shen,
W. Hu,* M. Liu*543–554

 π -Conjugated Molecules Crosslinked Graphene-Based Ultrathin Films and Their Tunable Performances in Organic Nanoelectronics

A highly efficient, iridium-based, yellow emitter with both dry- and wet-process feasibility is presented. The yellow OLED device exhibits, at 1000 cd m⁻², an efficacy of 75 lm W⁻¹ via evaporation deposition, the highest among all reported dry-processed yellow OLEDs, and 52 lm W⁻¹ via spin-coating, the highest among all wet-processed counterparts.



Organic Light-Emitting Diodes

J.-H. Jou,* Y.-X. Lin, S.-H. Peng, C.-J. Li,
Y.-M. Yang, C.-L. Chin, J.-J. Shyue,
S.-S. Sun, M. Lee, C.-T. Chen,
M.-C. Liu, C.-C. Chen, G.-Y. Chen,
J.-H. Wu, C.-H. Li, C.-F. Sung, M.-J. Lee,
J.-P. Hu555–562

Highly Efficient Yellow Organic Light Emitting Diode with a Novel Wet- and Dry-Process Feasible Iridium Complex Emitter