**Biosensing**

In article number 1700261, the Wu group presents poly(3,4-ethylenedioxythiophene) nanotubes (PEDOT NTs) conformally coated with porphyrin-based metal–organic framework nanocrystals (MOF-525), where MOF-525 serve as an electrocatalytic surface and PEDOT NTs act as a charge collector to rapidly transport the electron from MOF nanocrystals. The innovative composites establish a new generation of porous electrodes for highly efficient electrochemical biosensing.

**Carbon Nanodots**

Carbon nanodots (CNDs) have been widely investigated for theranostic applications including fluorescence imaging, photoacoustic imaging, photothermal therapy, and photodynamic therapy. In article number 1700325, Sei Kwang Hahn, Woosung Kwon, and co-workers develop dual-color-emitting CNDs uniquely designed by the electronic structure engineering for both futuristic multi-color bioimaging and optogenetic control of ion channels.

**Cell Imaging**

An entirely unexplored concept of simultaneously recognizing two receptors using high- and low-affinity ligands is developed in article number 1700147 by Katsunori Tanaka and co-workers. Ligating them in situ on the target cell surface offers a new paradigm for visualizing target cells with a high imaging contrast.
**CO₂ Reduction**

J. Wu, Y. Huang, W. Ye, Y. Li* ......................................... 1700194

**CO₂ Reduction: From the Electrochemical to Photochemical Approach**

CO₂ reduction to useful chemical fuels via the electrochemical or photochemical approach represents promising directions to convert and utilize this greenhouse gas molecule. The Review summarizes recent progress on the development, engineering, and understanding of CO₂ reduction electrocatalysts and photocatalysts.

**Anode Materials**

H. Ying, W.-Q. Han* ................ 1700298

**Metallic Sn-Based Anode Materials: Application in High-Performance Lithium-Ion and Sodium-Ion Batteries**

To overcome the main obstacles of poor cycling stability and low coulombic efficiency faced by metallic Sn-based anodes, a lot of modification methods have been developed, including size control, alloying, and structure design. In this review, the state-of-the-art works of metallic Sn-based anodes are summarized and classified, and the superiorities and limitations are analyzed and discussed.

**Communications**

**Carbon Nanodots**

H. Kim, Y. Park, S. Beack, S. Han, D. Jung, H. J. Cha, W. Kwon, S.-K. Hahn* ...................... 1700325

**Dual-Color-Emitting Carbon Nanodots for Multicolor Bioimaging and Optogenetic Control of Ion Channels**

A dual-color-emitting carbon nanodot (DC-CND) is successfully developed by the facile surface modification with 4-octyloxyaniline to emit two distinct colors according to the excitation wavelength. The biocompatible DC-CNDs show the great potential for multicolor bioimaging and the optogenetic control of channelrhodopsin-2.

**Cell Imaging**

M. Taichi, S. Nomura, I. Nakase, R. Imamaki, Y. Kizuka, F. Ota, N. Dohmae, S. Kitazume, N. Taniguchi, K. Tanaka* .......... 1700147

**In Situ Ligation of High- and Low-Affinity Ligands to Cell Surface Receptors Enables Highly Selective Recognition**

An entirely unexplored concept of simultaneously recognizing two receptors using high- and low-affinity ligands through ligating them on the target cell surface is reported. This de novo approach is inspired by the pretargeting strategy frequently applied in molecular imaging, and has now evolved as the basis of a new paradigm for visualizing target cells with a high imaging contrast.
A simple and scalable electrospinning strategy is developed for the concurrent synthesis of CoFe$_2$O$_4$ nanoparticles homogeneously embedded in N-doped carbon nanofibers (denoted as CoFe$_2$O$_4$@N-CNFs). The synthesized CoFe$_2$O$_4$@N-CNFs are demonstrated superior oxygen evolution reaction performance with a low overpotential, a large current density, a small Tafel slope, and long-term durability in alkaline solution.

Oxygen Evolution Reaction

T. Li, Y. Lv, J. Su, Y. Wang, Q. Yang, Y. Zhang, J. Zhou, L. Xu, D. Sun, Y. Tang

Anchoring CoFe$_2$O$_4$ Nanoparticles on N-Doped Carbon Nanofibers for High-Performance Oxygen Evolution Reaction

A novel, highly active, sulfur-tolerant anode composed of Ni nanoparticles, water-storable BaZr$_{0.4}$Ce$_{0.4}$Y$_{0.2}$O$_{3-\delta}$ perovskite, and amorphous BaO deposited on an Sm$_{0.2}$Ce$_{0.8}$O$_{1.9}$ scaffold is prepared by a facile impregnation and limited reaction protocol providing excellent operational stability and outstanding thermal cyclability, making it a promising direction in solid oxide fuel cells.

Solid Oxide Fuel Cells

Y. Song, W. Wang, L. Ge, X. Xu, Z. Zhang, P. S. B. Julião, W. Zhou, Z. P. Shao

Rational Design of a Water-Storable Hierarchical Architecture Decorated with Amorphous Barium Oxide and Nickel Nanoparticles as a Solid Oxide Fuel Cell Anode with Excellent Sulfur Tolerance

A novel nanocomposite consists of poly(3,4-ethylenedioxythiophene) nanotubes (PEDOT NTs) coated with porphyrin-based metal–organic framework nanocrystals (MOF-525) via in situ synthesis. The MOF-525 serves as an electrocatalytic surface and the PEDOT NTs act as a charge collector to rapidly transport the electron from MOF nanocrystals. The obtained nanocomposites establish a new generation of porous electrodes for highly efficient electrochemical biosensing.

Biosensing

T.-Y. Huang, C.-W. Kung, Y.-T. Liao, S.-Y. Kao, M. Cheng, T.-H. Chang, J. Henzie, H. R. Alami, Z. A. Alothman, Y. Yamauchi, K.-C. Ho, K. C.-W. Wu

Enhanced Charge Collection in MOF-525–PEDOT Nanotube Composites Enable Highly Sensitive Biosensing
**FULL PAPERS**

### Pathogen Detection

Q. Gan, X. Wang, Y. Wang, Z. Xie, Y. Tian, Y. Lu* ...........................1700127

**Culture-Free Detection of Crop Pathogens at the Single-Cell Level by Micro-Raman Spectroscopy**

A micro-Raman spectroscopy-based bioassay enables fast and noninvasive discrimination of plant pathogens, and accurate culture-free single-bacterium detection in plant tissue lesions with an identification ratio comparable to those of genetic molecular approaches.

### Actuating Devices

F. A. Hassani, W. Y. X. Peh, G. G. L. Gammad, R. P. Mogan, T. K. Ng, T. L. C. Kuo, L. G. Ng, P. Luu, S.-C. Yen,* C. Lee*........1700143

**A novel flexible actuating device driven by shape memory alloy wires** is developed and tested in a benchtop setup to study its potential in physically contracting a rubber replica of a bladder. The device is then implanted successfully in an anesthetized animal. This device can potentially help affected individuals with detrusor muscle atrophy to achieve facilitated micturition.

### Neural Clips

S. Lee, W. Y. X. Peh, J. Wang, F. Yang, J. S. Ho, N. V. Thakor, S.-C. Yen,* C. Lee* ......................................1700149

**Toward Bioelectronic Medicine—Neuromodulation of Small Peripheral Nerves Using Flexible Neural Clip**

The proposed novel flexible neural clip (FNC) enables easy and conformal implantation on a variety of the peripheral nerves, allowing fine-tuning of physiological processes such as micturition, heart rate, and muscle contractions. Furthermore, the wireless FNC remotes modulation of visceral pelvic nerves located deep in the body. This FNC would pave a way of wireless neural modulation for bioelectronic medicine in the future.

### Genotyping Techniques

G. He, J. Li, C. Qi, X. Guo* .....................................1700158

**Single Nucleotide Polymorphism Genotyping in Single-Molecule Electronic Circuits**

A straightforward and reliable single-molecule approach for precise single nucleotide polymorphism detection is developed through directly measuring the fluctuation of electrical signals in an electronic circuit, which is fabricated from a high-gain field-effect silicon nanowire decorated by a single hairpin DNA, in the presence of different target DNAs, promising a futuristic route toward the next-generation genotyping technique.
Embedded growth of Li$_2$O$_2$ is realized through a scientific fabrication of $\alpha$-MnO$_2$/Co$_3$O$_4$ cathode architecture, of which $\alpha$-MnO$_2$ plays the role of initially nucleation sites for Li$_2$O$_2$ while Co$_3$O$_4$ produces plenty of dissolved LiO$_2$, inducing the formation of large Li$_2$O$_2$ aggregations with embedded structure, and thus showing remarkably improved electrochemical performance of Li$_2$O battery.

Large-scale quasi-omnidirectional solar cells are successfully realized and featured by keeping high cell performance over broad incident angles, via employing Si nanopyramids as surface texture. Moreover, superior electrical performances are achieved in the Si nanopyramids-textured solar cells. As an overall result, higher daily/yearly electric energy can be produced compared to the conventional Si micropyramids-textured solar cells.

For the first time, an efficiency of over 8% is achieved for tin-based perovskite solar cells along with a high open-circuit voltage of 0.61 V by utilizing $(\text{FA})_{0.75}(\text{MA})_{0.25}\text{SnI}_3$ as the absorber. The cation-mixing method is proven to effectively improve the morphology of tin-based perovskite films and reduce recombination process in the devices.

Clean and nondefective surfaces are constructed on Li$_4$Ti$_5$O$_12$ particles through a facile sodium sulfide (Na$_2$S) assisted hydrothermal treatment. By improving the surface quality, a higher first cycle Coulombic efficiency ($\approx$95%), a significantly enhanced cycling performance, and rate capability are realized, which highlight the newly discovered surface reconstruction mechanism and the surface–property relationship.

Energy Storage

P. Zhang, S. F. Zhang, M. He, J. W. Lang, A. M. Ren, S. Xu,* X. B. Yan* ....................................1700172

Realizing the Embedded Growth of Large Li$_2$O$_2$ Aggregations by Matching Different Metal Oxides for High-Capacity and High-Rate Lithium Oxygen Batteries

Solar Cells

S. Zhong, W. Wang, M. Tan, Y. Zhuang, W. Shen* .....................................1700200

Realization of Quasi-Omnidirectional Solar Cells with Superior Electrical Performance by All-Solution-Processed Si Nanopyramids

Photovoltaics

Z. Zhao, F. Gu, Y. Li, W. Sun, S. Ye, H. Rao, Z. Liu,* Z. Bian,* C. Huang .....................................1700204

Mixed-Organic-Cation Tin Iodide for Lead-Free Perovskite Solar Cells with an Efficiency of 8.12%

Energy Storage

K. Qian, L. Tang, M. Wagener, Y.-B. He, D. Liu, H. Li, R. Shi, B. Li,* F. Kang* ....................................1700205

A Facile Surface Reconstruction Mechanism toward Better Electrochemical Performance of Li$_4$Ti$_5$O$_12$ in Lithium-Ion Battery
**FULL PAPERS**

### Energy Storage

Q.-C. Wang, E. Hu, Y. Pan, N. Xiao, F. Hong, Z.-W. Fu, X.-J. Wu, S.-M. Bak, X.-Q. Yang, Y.-N. Zhou

Utilizing Co²⁺/Co³⁺ Redox Couple in P2-Layered Na₀.₆₆Co₀.₂₂Mn₀.₄₄Ti₀.₃₄O₂ Cathode for Sodium-Ion Batteries

Na₀.₆₆CoₓMn₀.₆₆₋ₓTi₀.₃₄O₂ (0 ≤ x ≤ 0.33) for new cathode materials of sodium-ion batteries are designed and synthesized aiming to reduce transition metal ordering, charge ordering, as well as Na⁺ and vacancy ordering. The Co²⁺/Co³⁺ redox couple is revealed for the first time experimentally in the P2-layered cathodes, enabling a high rate capability with the help of Ti substitution.

### Bioelectronics

Z. Yan, T. Pan, M. Xue, C. Chen, Y. Cui, G. Yao, L. Huang, F. Liao, W. Jing, H. Zhang, M. Gao, D. Guo, Y. Xia, Y. Lin

Thermal Release Transfer Printing for Stretchable Conformal Bioelectronics

A low-cost, easy-to-operate, and temperature-controlled thermal release transfer printing method is successfully realized to form stretchable bioelectronics for medical systems. Using this method, a stretchable neural electrode array with metal/polyimide structure is fabricated by a sacrificial-layer-free process and is successfully used for detecting high-fidelity electrocorticography signals from the dura mater of anesthetized rat.

### Perovskites

M. Liu, G. Zhong, Y. Yin, J. Miao, K. Li, C. Wang, X. Xu, C. Shen, H. Meng

Aluminum-Doped Cesium Lead Bromide Perovskite Nanocrystals with Stable Blue Photoluminescence Used for Display Backlight

Doping aluminum (Al³⁺) ion into CsPbBr₃ nanocrystals (NCs) can afford lead-halide perovskite NCs with stable blue photoluminescence. Cation compositional engineering of perovskite NCs provides an additional way to rationally tune the photophysical property. By this way, emission spectra broadening and chromaticity drifting issues caused by fast anion exchange in different halide perovskite NCs based conversion layers can be avoid.

### Polymer Solar Cells

Z. Z. Zhang, L. L. Feng, S. T. Xu, Y. Liu, H. J. Peng, Z.-G. Zhang, Y. F. Li, Y. P. Zou

A New Electron Acceptor with meta-Alkoxynaphthyl Side Chain for Fullerene-Free Polymer Solar Cells with 9.3% Efficiency

A new electron acceptor (m-ITIC-OR) with meta-alkoxynaphthyl side chains is designed and synthesized. A power conversion efficiency of 9.3% is achieved in nonfullerene polymer solar cells, demonstrating that the meta-alkoxynaphthyl side chain is promising for constructing a high-performance electron acceptor due to its simplicity and low cost. m-ITIC-OR shows a great potential for photovoltaic applications.
A self-catalyzed strategy is used to synthesize crosslinked poly(ethylene glycol) diglycidyl ether-based solid polymer electrolyte in which lithium salts are used as a facile cationic polymerization catalyst. This crosslinked poly(ethylene glycol) diglycidyl ether-based solid polymer electrolyte presents excellent conductivity and assembled LiFePO$_4$/Li battery using this electrolyte displays stable charge/discharge profiles, considerable C-rate capability, and cycling performance.

Nanoporous thermoelectric composites are fabricated by a facile milling method, where nano-sized SiO$_2$ particles help to create randomly distributed nanopores throughout PbSe matrix. The existence of nanoporous structure significantly lowers the thermal conductivity with a low plateau above 600 K, eventually benefiting the thermoelectric efficiency of PbSe at moderate temperatures.

High device $ZT$ and efficiency can be achieved by segmenting a Bi$_2$Te$_2.27$Se$_{0.21}$ ingot and a Cu/I-doped Bi$_2$Te$_2.27$Se$_{0.8}$ sample. By extending the use of Bi$_2$Te$_3$ to higher temperatures, the overall efficiency is increased to 9.2%, which rivals that of mid temperature materials (hot side temperature $\approx$675–900 K), making Bi$_2$Te$_3$ competitive for waste-heat power generation applications.

Thermochromic fluorescent polymerized vesicles are successfully constructed in living cells by implementing a sequentially programmable self-assembling strategy, which may find use in various biomedical applications, as herein demonstrated by a proof-of-principle example for monitoring the cell apoptosis process involved in the overexpression of cholinesterase.
A strategy to deliver Cas9 protein and single guide RNA plasmid is reported by using a nanocarrier with a core of gold nanoclusters (GNs) and a shell of lipids. The nanoparticle (polyethylene glycol-lipid/GNs/Cas9 protein/sgPlk1 plasmid) can knockout Polo-like kinase-1 (Plk1) of target tumor and effectively suppress tumor progression in vitro and in vivo.

An approach for microRNAs (let-7a) replacement therapy based on rod-shaped pure drug nanoparticles (PNPs) is reported. PNPs deliver let-7a to cancer cells bypassing the lysosomal route and enable twofold increase of let-7a and threefold decrease of target protein in tumor and ≈100% inhibition of tumor-growth and lung-metastasis. This work provides a valuable nanoplatform for efficient and safe gene delivery.