Pattern Recognition

In article number 1600394, Almira Kurbangalieva, Katsunori Tanaka, and co-workers at the RIKEN Biofunctional Synthetic Chemistry Laboratory develop a way to engineer glycan complexes—heterogeneous clusters of sugar chains attached to proteins or lipids—in a way that allows the molecules to be transported preferentially to specific organs of the body through pattern recognition mechanisms, depending on the sugar chains contained in the cluster.

Cell Migration

Mesenchymal stem cells, harvested from the bone marrow, alter their behavior depending on the local curvature of the 3D-printed surfaces they are seeded upon, as described by Ansgar Petersen and co-workers in article number 1600347. While concave surfaces promote stem cell migration, convex surfaces enhance cell specification into bone cells, a process driven by curvature-dependent forces on the cell’s nucleus.

Strain Sensors

Extremely stretchable self-healing strain sensors based on conductive hydrogel are demonstrated by Pooi See Lee and co-workers in article number 1600190. The strain sensor provides good response, stability, and signal repeatability under various human motion detections.
**Carcinogenesis**

Z. Wang, H. Liu,* S. Liu* ............... 1600248

Low-Dose Bisphenol A Exposure: A Seemingly Instigating Carcinogenic Effect on Breast Cancer

The association between bisphenol A (BPA) and breast cancer has been a concern over the years. However, most current studies focus on the carcinogenic effects of BPA at high doses without considerable attention being paid to extremely low doses. In this review, recent findings on the carcinogenic effects of low-dose BPA on breast cancer and possible mechanisms are summarized.

**Energy Storage**

T. Wang, S. Chen, H. Pang,* H. Xue, Y. Yu* ........................................ 1600289

MoS₂-Based Nanocomposites for Electrochemical Energy Storage

This review focuses on the physical and chemical properties of MoS₂ and its applications in Li-ion batteries, Na-ion batteries, and supercapacitors. Significant recent progress is summarized. Reaction mechanisms and relationships between morphologies (from 0D to 3D) and the electrochemical performances of MoS₂-based nanocomposites in the three typical and promising rechargeable systems are discussed.

**Pattern Recognition**

L. Latypova, R. Sibgatullina, A. Ogura, K. Fujiki, A. Khabibrakhmanova, T. Tahara, S. Nozaki, S. Urano, K. Tsubokura, H. Onoe, Y. Watanabe, A. Kurbangalieva,* K. Tanaka* ... 1600394

Sequential Double “Clicks” toward Structurally Well-Defined Heterogeneous N-Glycoclusters: The Importance of Cluster Heterogeneity on Pattern Recognition In Vivo

Structurally well-defined heterogeneous N-glycoclusters are prepared on albumin via a double click procedure. The number of glycan molecules present, in addition to the spatial arrangement of glycans in the heterogeneous glycoclusters, plays an important role in the in vivo kinetics and organ-selective accumulation through glycan pattern recognition mechanisms.

**Strain Sensors**

G. F. Cai, J. X. Wang, K. Qian, J. W. Chen, S. H. Li, P. S. Lee* .................................. 1600190

Extremely Stretchable Strain Sensors Based on Conductive Self-Healing Dynamic Cross-Links Hydrogels for Human-Motion Detection

Extremely stretchable self-healing strain sensors based on conductive hydrogels are successfully fabricated. The strain sensor can achieve autonomic self-heal electrically and mechanically under ambient conditions, and can sustain extreme elastic strain (100%) with high gauge factor of 1.51. Furthermore, the strain sensors have good response, signal stability, and repeatability under various human motion detections.
Red blood cells are “shaken” with a holographic optical tweezer array. The flow generated around cells due to the periodic optical forcing is measured with an optically trapped “detector” particle located in the cell vicinity. A signal-processing model that describes the cell’s physical properties as an analog filter illustrates how cells can be distinguished from each other.

The synthesis, sorting, and characterization of monodisperse gold nanorods with dimensions around 10 nm in length and below 6 nm in diameter is reported. They display tunable plasmon resonance in the near infrared, a region where cellular absorption is reduced. A dual color photothermal microscope is developed to demonstrate that they are promising single molecule probes for bioimaging.
Passivation of Lithium Metal Anode via Hybrid Ionic Liquid Electrolyte toward Stable Li Plating/Stripping

Hybrid electrolyte of ionic liquid and ethers is used to passivate the surface of Li metal surface via modification of the as-formed solid electrolyte interphase with N-propyl-N-methylpyrrolidinium bis(trifluoromethanesulfonyl) amide (Py13TFSI), thereby reducing the side reactions between the Li metal and electrolyte, leading to remarkably suppressed Li dendrite growth and mitigating Li metal corrosion.

Microfluidic Patterning of Metal Structures for Flexible Conductors by In Situ Polymer-Assisted Electroless Deposition

A low-cost, solution-processed, versatile, microfluidic approach is developed for patterning structures of highly conductive metals (e.g., copper, silver, and nickel) on chemically modified flexible polyethylene terephthalate thin films by in situ polymer-assisted electroless metal deposition. This method has significantly lowered the consumption of catalyst as well as the metal plating solution.

Surface Curvature Differentially Regulates Stem Cell Migration and Differentiation via Altered Attachment Morphology and Nuclear Deformation

The influence of 3D surface curvature on stem cell migration and differentiation is reported. Concave surfaces enable the cell body to lift off the surface resulting in increased motility while on convex surfaces, cytoskeletal tension induces nuclear deformation and enhances osteogenic differentiation. The study reveals curvature-sensation of stem cells with relevance for biomaterial design and tissue regeneration.

Rapid 3D Refractive-Index Imaging of Live Cells in Suspension without Labeling Using Dielectrophoretic Cell Rotation

A new label-free tomographic interferometry approach is presented, which provides rapid 3D imaging of single live cells in suspension without labeling. The cells flow in a microfluidic channel, are trapped and rapidly rotated by dielectrophoretic forces, with full angular coverage on any axis, and their interferometric projections are acquired and processed into the cellular 3D refractive-index maps.
A pH-sensitive nanoparticle-based small interfering RNA (siRNA) delivery system (PNSDS) is developed. PNSDS is a positive-charge-free nanocarrier, composed of siRNA chemically crosslinked with multi-armed poly(ethylene glycol) carriers via acid-labile acetal linkers. PNSDS with mannose targeting moieties can selectively accumulate in mice liver, induce specific inhibition of macrophage TNF-α expression in vivo, and consequently protect mice from inflammation-induced liver damages.

SiRNA Delivery Systems
Y. Tang, Z. Zeng, X. He, T. Wang, X. Ning,* X. Feng*  .....................1600228
SiRNA Crosslinked Nanoparticles for the Treatment of Inflammation-induced Liver Injury

A versatile and unique photothermal platform based on gold nanoshells is developed to overcome the thermal resistance of cancer cells. The dual functional near infrared light specifically releases small interfering RNAs from gold surface for silencing heat shock protein, and increases temperature to synergize with the gene silencing effect for sensitized hyperthermia therapy.

Photothermal Therapy
Z. H. Wang, S. W. Li, M. Zhang, Y. Ma, Y. X. Liu, W. D. Gao, J. Q. Zhang, Y. Q. Gu* .....................................1600327
Laser-Triggered Small Interfering RNA Releasing Gold Nanoshells against Heat Shock Protein for Sensitized Photothermal Therapy

A kind of novel poly (vinylene carbonate)-based solid electrolyte with good interfacial compatibility for high voltage lithium batteries is generated via a facile in situ polymerization process. LiCoO$_2$/Li battery using this poly (vinylene carbonate)-based solid electrolyte displays stable charge/discharge profiles, considerable rate capability, excellent cycling performance, and decent safety characteristic.

Energy Storage
J. Chai, Z. Liu,* J. Ma, J. Wang, X. Liu, H. Liu, J. Zhang, G. Cui,* L. Chen ........................................1600377
In Situ Generation of Poly (Vinylene Carbonate) Based Solid Electrolyte with Interfacial Stability for LiCoO$_2$ Lithium Batteries