SB-11

Highly Efficient, Flexible Thin Film Nanogenerator

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Energy harvesting technologies converting external sources (such as thermal energy, vibration and mechanical energy from the nature sources of wind, waves or animal movements) into electrical energy is recently a highly demanding issue in the materials science community for making sustainable green environments. In particular, fabrication of usable nanogenerator attract the attention of many researchers because it can scavenge even the biomechanical energy inside the human body (such as heart beat, blood flow, muscle stretching, or eye blinking) by converging harvesting technology with implantable bio-devices. Herein, we describe procedure suitable for generating and printing a lead-free microstructured $BaTiO_3$ thin film nanogenerator on plastic substrates to overcome limitations appeared in conventional flexible ferroelectric devices. Flexible $BaTiO_3$ thin film nanogenerator was fabricated and the piezoelectric properties and mechanically stability of ferroelectric devices were characterized. From the results, we demonstrate the highly efficient and stable performance of $BaTiO_3$ thin film nanogenerator and the integration of bio-eco-compatible ferroelectric materials may enable innovative opportunities for artificial skin and energy harvesting system.

Keywords: Energy Harvesting, Nanogenerator, Flexible electronics

SB-12

Assembly of Biomimetic Peptoid Polymers

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The design and synthesis of protein-like polymers is a fundamental challenge in materials science. A biomimetic approach is to explore the impact of monomer sequence on non-natural polymer structure and function. We present the aqueous self-assembly of two peptoid polymers into extremely thin two-dimensional (2D) crystalline sheets directed by periodic amphiphilicity, electrostatic recognition and aromatic interactions. Peptoids are sequence-specific, oligo-N-substituted glycine polymers designed to mimic the structure and functionality of proteins. Mixing a 1:1 ratio of two oppositely charged peptoid 36 mers of a specific sequence in aqueous solution results in the formation of giant, free-floating sheets with only 2.7 nm thickness. Direct visualization of aligned individual peptoid chains in the sheet structure was achieved using aberration-corrected transmission electron microscopy. Specific binding of a protein to ligand-functionalized sheets was also demonstrated. The synthetic flexibility and biocompatibility of peptoids provide a flexible and robust platform for integrating functionality into defined 2D nanostructures. In the later part of my talk, we describe the use of metal ions to construct two-dimensional hybrid films that have the ability to self-heal. Incubation of biomimetic peptoid polymers with specific divalent metal ions results in the spontaneous formation of uniform multilayers at the air-water interface. We anticipate that ease of synthesis and transfer of these two-dimensional materials may have many potential applications in catalysis, gas storage and sensing, optics, nanomaterial synthesis, and environmentally responsive scaffolds.

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