IBS Seminar

Biomimetic functional hydrogels with anisotropic structures

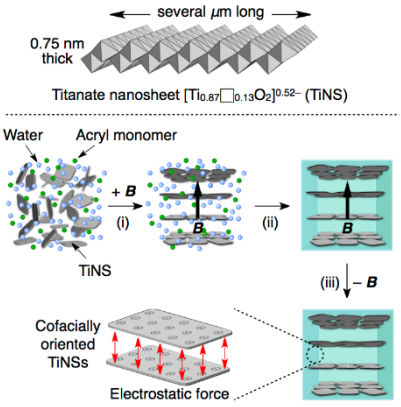
Younsoo Kim, Prof. Ph.D.

■ DATE & TIME: October 5th (Fri) 11:00 AM
■ PLACE: Research Bldg. 1, #112, POSTECH

Younsoo Kim

Department of Materials Science and Engineering,
Pohang University of Science and Technology (POSTECH)
Email : ysookim@postech.ac.kr

The development of muscle-like hydrogel actuators that can convert chemical energies into large, quick, and unidirectional motions is one of the long-standing research topics in materials sciences. Various hydrogel actuators have been developed so far, however, their actuation has inherent limitation in efficiency, because of their primitive actuation mechanism simply relying on the volume changes through the swelling and deswelling of gel networks. In addition, the volume changes are usually isotropic and not suitable to produce anisotropic motion. These limitations could be overcome through the imitation of mechanisms shown in Nature's living creatures, offering an enormous potential for the development of functional soft materials that may improve our life. As represented by muscular tissues, some biological tissues are composed of numerous nanoscopic subunits that are assembled into anisotropically oriented structures extending over a macroscopic size regime. Such hierarchical structures are the origin of the excellent biological functions, and their reproduction in artificial systems is a great challenge. To address this challenge, we have recently developed polymer networks with 'single-crystal-like' structural order, where 2D-shaped inorganic materials were employed as constituents. This 3D network of this hydrogel is composed of a stimuli-responsive polymer, so that the polarity and dynamics of the gel matrix are abruptly changed in response to external stimuli, which causes the switching of the intensity of the 'embedded electrostatics'. Thereby, it produces quick and anisotropic deformation of the hydrogel. In this presentation, their unprecedented functions originating from anisotropic structures will be discussed.



Scheme 1. Schematic representation of the preparation of anisotropic hydrogel containing cofacially oriented 2D materials.

Contact: Hye-in Oh (ohio@ibs.re.kr / 279-9935)

Center for Self-assembly & Complexity