

SB-5

Functional Nanomaterials Based on Nanoporous Template

김진곤[†], 양승윤, 변진석, 전금혜, 조아라

포항공과대학교 화학공학과
(jkkim@postech.ac.kr[†])

Nanoporous templates have been widely used for the development of new functional nanostructured materials suitable for electronics, optics, magnetism, and energy storage materials. We have prepared nanoporous templates by using thin films of mixtures of polystyrene-block-poly (methyl methacrylate) (PS-b-PMMA) and PMMA homopolymers. These templates have cylindrical nanoholes spanning the entire thickness of the film. Some applications of nanoporous templates are introduced: a) anti-reflective coating, b) the preparation of conducting polymer nanowires of poly (pyrrole), poly (3,4-ethylenedioxythiophene) onto a glass coated with indium-tin-oxide, and c) the separation membranes for biomaterials. We found that when the pore fraction of nanoholes in the film was ~ 0.68 , almost zero reflectance at a specific wavelength, which can be changed with film thickness, was achieved at visible wavelengths. Furthermore, ultra high density array of conducting nanowires was successfully prepared onto various substrates including flexible polymer. Due to highly alignment of polymer chain along the nanowire direction, the conductivity was much increased. Furthermore, these nanoporous films were found to be very effective for the separation of human Rhinovirus type 14 (HRV 14), major pathogen of a common cold in humans, from the buffer solution. We also found that when the pore size was effectively controlled down to 6 nm, a single file diffusion was observed.

Keywords: Nanomaterials, Porous Template, Conducting polymer nanorods

SB-6

Nanostructured Photoelectrode Materials for Improving Light-Harvesting Properties in DSSCs

정현석[†]

국민대학교 신소재공학부
(hjung@kookmin.ac.kr[†])

Photoelectrochemical solar cells such as dye-sensitized cells (DSSCs), which exhibit high performance and are cost-effective, provide an alternative to conventional p-n junction photovoltaic devices. However, the efficiency of such cells plateaus at 11~12%, in contrast to their theoretical value of 33%. The majority of research has focused on improving energy conversion efficiency of DSSC by controlling nanostructure and exploiting new materials in photoelectrode consisting of semiconducting oxide nanoparticles and a transparent conducting oxide electrode (TCO). In this presentation, we introduce monodispersed TiO₂ nanoparticles prepared by forced hydrolysis method and their superiority as photoelectrode materials was characterized with aids of optical and electrochemical analysis. Inverse opal-based scattering layers containing highly crystalline anatase nanoparticles are also introduced and their feasibility for use as bi-functional light scattering layer is discussed in terms of optical reflectance and charge generation properties as a function of optical wavelength.

Keywords: Solar cell, Dye-sensitized cells