Synthesis of Amphiphilic Copolymers for Mesoporous TiO_2 Films in Dye-sensitized solar cells

이재훈, 임정엽, 전하림, 이정민[1], 김종학†
연세대학교; [1]국방과학연구소
(jonghak@yonsei.ac.kr†)

Amphiphilic copolymers composed of poly(styrene-b-butadiene-b-styrene) (SBS) backbone and poly(oxyethylene methacrylate) (POEM) side chains were synthesized via free radical polymerization. The SBS-g-POEM copolymers were used as structure directing agent and mixed with hydrophilically preformed TiO_2 (Pre-TiO_2). The organized mesoporous TiO_2 (Meso-TiO_2) films result from self-assembly of SBS-g-POEM. To investigate the effect of side chain length on TiO_2 structure, SBS-g-POEM with different numbers of ethylene oxide repeating units, SBS-g-POEM (500) and SBS-g-POEM (950) were used to make Meso-TiO2 films. The effect of polymer side chain length on Meso-TiO_2 properties was investigated in detail using field-emission scanning electron microscope (FE-SEM), ultraviolet (UV)-visible reflectance spectroscopy, and N_2 adsorption-desorption measurements. The efficiencies of dye-sensitized solar cells with using Meso-TiO_2 (500, 950) was 5.7% and 5.8% at 100 mW/cm^2, respectively, which was much higher than one (4.8%) with randomly-organized TiO_2.