Preparation of TiO_2 Nanofiber Photoelectrode and Application to Dye-Sensitized Solar Cells

백형렬, 박경희*, 구할본
전남대학교 공과대학 전기공학과
(see0936@chonnam.ac.kr*)

TiO_2 Photoanodes were prepared using a mixture of TiO_2 nano-particles (P90) and the nanofiber with various contents and their application for dye-sensitized solar cells (DSSCs) were investigated. The formed fibers were visualized from transmission electron microscopy (TEM) and X-ray diffraction (XRD). The TiO_2 films were characterized by ATR-FTIR, field emission scanning electron microscopy (FE-SEM) and high resolution transmission electron microscopy (HR-TEM). The photoelectrochemical properties of the thin films and the performance of DSSCs were measured by photovoltaic-current density, AC impedance and monochromatic incident photon-to-current conversion efficiency (IPCE). Energy conversion efficiency of approximately 7.0 % has been achieved for cell with conductive glass under illumination with AM 1.5 (100 $mWcm^{-2}$) simulated sunlight. High efficiency was obtained by TiO_2 nanofiber which means large surface area that can help for large amount of dye molecules adsorbed on the surface. DSSCs made of TiO_2 nanofiber/nanoparticle films as photoanodes achieved better photo-energy conversion efficiency as compared to those prepared using commercially available Degussa P25 nanoparticle films.