

In-Situ Formation of Dye-sensitized Solar Cells based on High Ordered TiO₂ Photoelectrode with Photodegradation and Sol-Gel Process

김상진, 노동규, 서진아, 전하림, 김종학*
연세대학교 화공생명공학과
(jonghak@yonsei.ac.kr*)

In DSSCs, photoelectrode of high specific surface area performs a significant role due to increase the dye loading, which might help to enhance the cell performance and transforming it into electricity. Thus, focus on fabrication of high surface area of photoelectrode and achieve appreciable efficiency of photoconversion devices in this research. TiO₂ nanoparticles were surface-modified via atom transfer radical polymerization (ATRP) with hydrophilic poly (methyl methacrylate) (PMMA), which can photodegradable by UV irradiation. Following application of a photodegradation process, sol-gel process and calcination at 450°C, photoelectrode with high ordered structure were generated. As a demonstration of a potential application, these high ordered TiO₂ have been used as a photoelectrode to fabricate DSSCs using a quasi solid polymer electrolyte. High ordered TiO₂ photoelectrode with efficiencies of 5.1% was recorded under light intensity of 100mW/cm² illumination which was significantly higher than a commercial Degussa P25 TiO₂ nanoparticle photoelectrode (3.8%).