Sol gel synthesized nanosilica as photoanode material for dye sensitized solar cells (DSSCs) system

Abstract

Dye-sensitized solar cells (DSSCs) have been extensively studied due to their promising potential for high efficiency, low production cost and eco-friendly production. The photoanode of DSSCs is traditionally composed of randomly packed TiO2 nanoparticles which have large specific surface area and suitable band gap (3.2 eV) for the effective injection of electrons from the dye molecules to the semiconductor. However, its high surface charge recombination rate accounts for its low efficiency. Alternatively, silica which is chemically inert, thermally stable, high surface area, and inexpensive can be used to substitute TiO2 as photoanode material. However, bulk silica has a wide band gap of 8.9 eV and its band gap need to be narrowed in order to use it as photoanode materials. Thus, in this study, the effect of nanosilica photoanode and its particle size on the performance of dye sensitized solar cell are investigated and characterized. The result is then compared with the fumed silica and conventional TiO2 DSSCs. Although the results shows that photon-electron conversion is inferior compared to TiO2 photoanode, it has a great potential as the fabrication cost is low and more environmental friendly.

Keywords : Dye Sensitized Solar Cell, Photoanode material, Nanosilica, Sol gel synthesis