Development in photoanode materials for highly efficient dye sensitized solar cells

Abstract

Dye-sensitized solar cells (DSSC) have been extensively studied due to their promising potential for high efficiency, low production cost and eco-friendly production. The photoanode is one of the main components in DSSCs which determines its performance. The main issues facing in DSSCs are the charge recombinations and low light harvesting capacity. Conventional TiO² nanoparticles with large surface area has low light scattering ability and low electron transport rate while one dimensional nanostructures have high electron transport rate and good light scattering ability but has a low surface area. Different approaches such as nanocomposite, light scattering layer and hierarchical structures to improve performance of 1D DSSCs are discussed. Besides that, works done on the optimization of TiO² photoanode in cobalt based DSSC is also discussed. Additionally, doping of TiO² to improve the properties of TiO² and studies on alternative photoanode materials which involved the application of band gap engineering are discussed to further improve the performance of DSSCs.