# Controlling Electrophoretic Deposition (ED) Cycles in Order to Fabrication of High Efficient Dye-Sensitized Solar Cell (DSSC)

**Masood Hamadanian[1,2*], Afshar Gravand[1], Vahid Jabbari[1]**

[1]Institute of Nanoscience and Nanotechnology, University of Kashan, Kashan, IRAN

[2]Department of Physical Chemistry, Faculty of Chemistry, University of Kashan, Kashan, IRAN

**Abstract**

Dye-sensitized solar cells (DSSCs) consist of the $TiO_2$ nanostructure film of the photoelectrode, dye molecules absorbed on the surface of the $TiO_2$ nanostructure film, an electrolyte layer and a counter electrode. Among these, nano-porous $TiO_2$ film state (especially film thickness) plays an important role as the photoelectrode in DSSCs because it adsorbs a large number of the dye molecules which provide electrons. The thickness variation influences on the internal impedances of DSSC related to the electron transport. Also, it was noted that the variation of the nanoporous $TiO_2$ thickness has a much important effect on the electron transport in the DSSC. The main goal of this study is investigating the effects numbers of deposition cycles of electrophoretic deposition (EPD) and thickness of the $TiO_2$ films annealed in different temperatures on the properties of nanoporous P25 electrodes in order to efficiently control and optimize the main fabrication step of the DSSCs. Using combination of N719-sensitized P25 film as photoanode, Pt-coated FTO as photocathode, and $I^-/I_3^-$ as electrolyte, DSSCs was produced. Current–voltage (I-V) measurements were performed to investigate performance characteristics of the prepared electrodes derived from $TiO_2$. Experimental results indicate that the effects of bulk traps and surface states within $TiO_2$ films on recombination of photo-injected electrons in DSSCs depend upon annealing temperature of $TiO_2$ nanoparticles.

**Keywords:** Nanoparticles; $TiO_2$; Electron Transfer; Photovoltaics; DSSC; Energy Conversion

*Corresponding author; Tel: +98 361 5912382; Fax: +98 361 5552930; P.O. Box 87317-51167.
Email: hamadani@kashanu.ac.ir (M. Hamadanian)