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Dye-sensitized solar cells (DSSCs): A new cheap photovoltaic alternative for energy production

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Photovoltaic technologies have been investigated widely as fossil fuel becomes depleted. Especially, the dye-sensitized solar cell (DSSC) invented by Michael Gratzel in 1991 is in the limelight as a promising alternative to the silicon solar cell because of low cost, simple fabrication, flexibility and transparency. The DSSC consists of sensitizing dye, nanoporous metal oxide film, electrolyte and opposite electrode. The operations of the DSSCs are based on the injection of an electron from photoexcited state of the sensitized dye into the conduction band of the nanocrystalline TiO_2 . The electrons are transferred to the external load through the nanoporous TiO_2 film and the sensitized dye is regenerated by the redox system of the electrolyte regenerated itself at the platinum layer of the counter electrode. In the TiO_2 -based DSSCs, photo-induced charge separation occurs by electron transferring at the TiO_2 /dye/electrolyte interfaces, and the charges travel in TiO_2 and an electrolyte separately. In order to achieve high efficiency of the solar cells, these charge transfer and transport rates should be controlled so that all electrons are extracted for external load without charge recombination. The transport and transfer rates are interdependent, and thus simultaneous control of the rates is important to achieve high efficiency.

Biography

Vahid Jabbari studied Chemistry and his research interests covers a wide range of subjects in Nanoscience and Nanotechnology ranging from Nanomaterials and Nanostructures to Nanoelectronics and Photovoltaic. He has published over 20 original ISI papers in prestigious journals. He was elected as invited speaker in a number of international conferences including "2013 International Conference on Resources & Environmental Sustainable Development (RESDD)", Shenyang, China 2013, "2013 EMN East Workshop on Titanium Dioxide", Beijing, China 2013, "2nd Annual International Conference on Resources & Environmental Sustainable Development (RESDD)", Shenyang, China 2014 and "2014 EMN Summer Meeting on Energy Materials Nanotechnology", Cancun, Mexico 2014.

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