

Dye Sensitized Solar Cells

DSSC is a Photovoltaic cell. It converts light energy into electrical energy by the use of organic dyes and semiconductors. There are three generations in Solar cell technology depending on basic material. Those are,

- i) Silicon Solar cells
- ii) Thin film Solar cells
- iii) DSSC Perovskite, Organic Colloidal quantum dot Solar cells

Components of DSSC

The major constitution components of DSSC are photoelectrode, counter electrode and electrolyte. The photoelectrode consists of nanocrystalline mesoporous semiconductor material (TiO_2) layered on transparent conducting oxide substrate. The mesoporous semiconductor sensitized with dye molecule to adsorbed and formed monolayer on semiconductor surface. The counter electrode consists of catalytic material placed on transparent conducting oxide substrate. The electrolyte consists of redox couple system, which connects and transports the charge between counter electrode and photoelectrode. In generally, fluorine doped tin oxide based transparent conducting oxide glass material used in DSSC application.

Working process of DSSC

In DSSC, the dye molecules undergo photo excitation when absorbs invisible photon solar light, then electrons move from the ground state (HOMO) to excited state (LUMO) of dye molecules. This is followed by photo excited dye molecules subsequently inject of electrons into conduction band of mesoporous nanocrystalline wide bandgap semiconductor material deposited on the transparent conducting substrate. The charge separation occurs at the interface of excited dye into the conduction band of the semiconductor. Side by the oxidized dye molecules whereas regenerated at their ground state by collecting electron from redox couple presents in the electrolyte. Then the collected electrons move through the outer circuit to load and ultimately reached counter electrode where the electron regenerate redox couple electrolyte.

Polymer Electrolyte and dyes

The Polymer electrolytes such as solid polymer electrolytes and gel polymer electrolytes are promising candidates for replacing liquid electrolytes in DSSC. However, the ionic conductivity of Polymer electrolytes considerably lower than that of liquid electrolytes. To overcome this problem several processes have been carried out such as increasing the amount of inorganic salts and addition of low molecular weight organic liquid plasticizers such as ethylene carbonate and propylene carbonate with polymer matrix.

For better efficiency and stability synthetic dyes are used.

Proposal

- To study the efficiency of DSSC for various solid polymer electrolyte and natural dyes.