

Fabrication of high efficiency and low cost flexible Organic Solar Cell



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An organic solar cell or plastic solar cell is a type of photovoltaic that uses organic electronics, a branch of electronics that deals with conductive organic polymers or small organic molecules for light absorption and charge transport to produce electricity from sunlight by the photovoltaic effect. Most organic photovoltaic cells are polymer solar cells. The molecules used in organic solar cells are solution process able at high throughput and are cheap, resulting in low production costs to fabricate a large volume.

Transparent conducting oxide (TCO) thin films have been extensively studied as key optoelectric material due to their unique combined electrical and optical properties. Zinc tin oxide (ZTO) thin film is one of the most promising materials. ZTO is a wide band gap semiconducting material with band gap of 3.6 eV and owing to its complex crystal structure, it has improved stability in adverse conditions as compared to binary oxides. They have both the advantages of good thermal stability and mechanical strength of SnO₂ and good stability of ZnO under the reducing atmosphere. Amorphous ZTO (a-ZTO) film has a smoother surface morphology and cleaner etched profile than those of the crystalline ITO films.

Vanadium pentaoxide is the inorganic compound with the formula V₂O₅. Vanadium Pentoxide, one among the transition metal oxides, is an interesting material for scientific and technological applications. As an alternative to PEDOT:PSS, thermally evaporated layers of a transition metal oxide (TMO) have been used for efficient hole extraction on top of inverted organic solar cells, e.g. MoO₃, WO₃, V₂O₅, NiO.

Polyethylene terephthalate poly ethylene terephthalate (PET) is the most common thermoplastic polymer resin of the polyester family. The majority of the world's PET production is for synthetic

fibers. In PET is referred to by its common name, polyester. PET consists of polymerized units of the monomer ethylene terephthalate, with repeating ($C_{10}H_8O_4$) units. PET is commonly recycled. Depending on its processing and thermal history, polyethylene terephthalate may exist both as an amorphous (transparent) and as a semi-crystalline polymer. The semi-crystalline material might appear transparent (particle size less than 500 nm) or opaque and white (particle size up to a few micrometers) depending on its crystal structure and particle size PET can be semi-rigid to rigid, and it is very lightweight. Phenyl-C₆₁-butyric acid methyl ester (PCBM) is a fullerene derivative of the C₆₀ buckyball that was first synthesized in the 1990s by Fred Wudl's group. It is an electron acceptor material and is often used in plastic solar cells or flexible electronics in conjunction with electron donor materials such as P3HT or other polymers. Fig.1 shows synthesis and some characterization of organic solar cell.

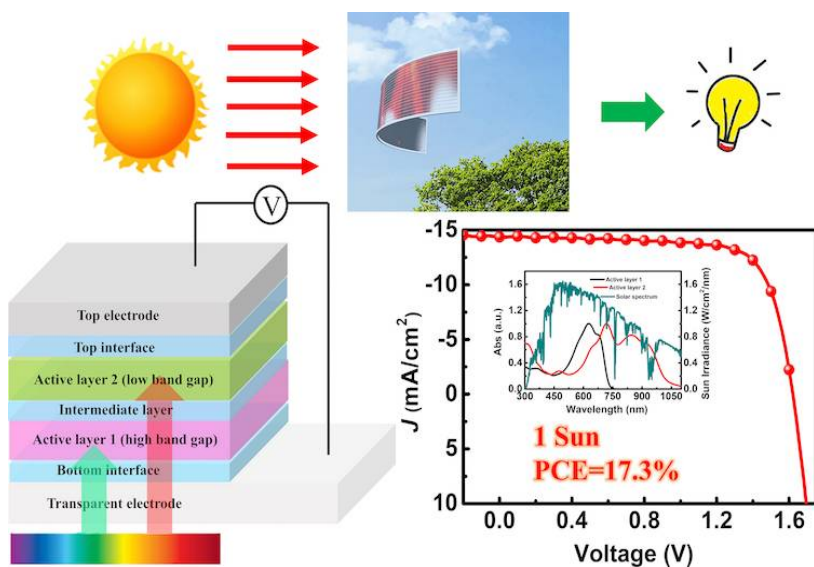


Figure 1. Synthesis and characterization of organic solar cell.