

PHOTOVOLTAIC CELLS BASED ON ORGANIC THIN FILMS

Ștefan ANTOHE

Research Development Centre for Materials and Electronic and Optoelectronic Devices

University of Bucharest, Faculty of Physics, P.O.Box:MG-11, Bucharest-Magurele, 077125 ROMANIA, E-mail: santohe@solid.fizica.unibuc.ro

Abstract

*In this work are summarized the electrical and photoelectrical properties of the organic photovoltaic cells based on the organic thin layers. Starting with the single-layer photovoltaic structures, the ITO/CuPc/Al and ITO/TPyP/Al has been prepared and characterized, where the organic layers of CuPc and TPyP, are Copper Phthalocyanine and 5,10,15,20-Tetra (4-Pyridyl)21H,23H-Porphine, respectively. The photovoltaic structures based on the p-n heterojunction present at the interface between two organic layers, like, ITO/CuPc/TPyP/Al and ITO/Chl a/TPyP/Al, exhibits stronger spectral sensitivity and better spectral matching to a solar spectrum than Schottky cells using either CuPc or TPyP, layer. Three-layered organic solar cells with an interlayer of co deposited dyes of p-type CuPc and n-type TPyP, between the respective dye layers were also prepared and characterized. They showed increased power conversion efficiency, due to the efficient carrier photogeneration in the enlarged photoactive region from the code posited layer. The spectral sensitization of a-Si:H solar cells using an organic layer was also obtained. The action spectrum was extended by 30 nm to longer wavelength range, using a 100 nm thick layer of TPyP. An exciton dissociation process explains the sensitization to the TPyP/a-Si:H interface, which gives rise of higher quantum efficiency at longer wavelengths. Hybrid structures like nanostructured ZnO/sensitized with CuPc dye/Au photovoltaic cells were fabricated and characterized too, few from them showing values of the external quantum efficiency more than 12%. However, those structures needs to be improved to increase their optical efficiency and charge collection. Finally, few from the most new and performing experimental facilities in the field of preparation and characterization of organic photovoltaic cells of the **Research Development Centre for Materials and Electronic and Optoelectronic Devices of University of Bucharest** will be presented.*

Keywords: organic semiconductors, photovoltaic cells, organic thin layers