
66 - Polymer based nanocomposites for plastic solar cells

Jérôme Faure-Vincent, Saïd Sadki,
LEMOH/SPrAM UMR 5819 (CEA, CNRS, UJF)/INAC, CEA Grenoble

Energy and environment are the most challenging issues for human being. Most renewable energy comes directly or indirectly from the sun. To convert solar energy efficiently to other form of energy, for example electricity that can be easily used is the point of research. Significant progress has been accomplished in developing solar cells, including inorganic, organic, hybrid organic-inorganic and dye sensitized solar cells¹.

This laboratory experiment will teach the basic principles and measurements of bulk hetero-junction P3HT/PCBM solar cells.

This experimental project will focus on the field of organic solar cells consisting of an intimate mixture of conjugated polymer donor like poly (3 hexythiophene) (P3HT) with a methanofullerene acceptor like PCBM. Electronic properties of P3HT and PCBM materials will be analysed by electrochemical techniques like cyclic voltammetry (CV) and differential pulse voltammetry (DPV). These techniques are very powerful tools to determine the oxidation and reduction potential of the acceptors and donors materials. Consequently the HOMO, LUMO level and the electrochemical band gap of the P3HT and PCBM level will be extrapolated. Spectroscopic analysis (UV visible and photoluminescence) will be carried out to compare the electrochemical band gap with the optical energy gap. This part of the practical will thus give an insight into the principle of polymer-based organic solar cells.

In addition to these aspects, the students will fabricate their own solar cells using simple device fabrication techniques available at the laboratory, including blending P3HT and PCBM, spin coating on ITO and evaporation of Al top contacts (see figure 1). They will also measure the electrical properties in a glove box under AM 1.5 sun simulator and see how it performs at various light illuminations.

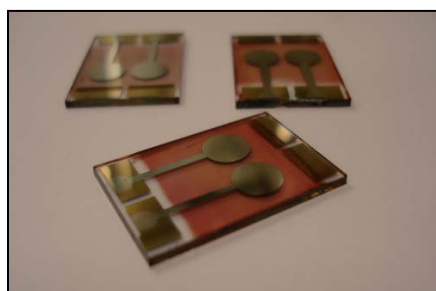


Figure 1: Polymer-based solar cells prepared at the LEMOH laboratory

Profile: Students interested by the field of novel materials for renewable energies and by research areas involving a multidisciplinary approach (physico-chemistry, electrochemistry, spectroscopy).

1) http://en.wikipedia.org/wiki/Konarka_Technologies