Abstract

In this master thesis have been investigated the electrical and optical properties of PEDOT:PSS thin films. Poly(3,4-ethylenedioxythiophene) polystyrenesulfonate (PEDOT:PSS) is a transparent conductor material that is widely used in organic light-emitting diodes and organic photovoltaics. PEDOT:PSS exhibits good conductivity, good optical transparency in thin film form and high stability. Conductive PEDOT:PSS opens opportunities to replace the expensive and vacuum processed inorganic electrodes such as Indium Tin Oxide in organic electronic devices.

The current thesis is constituted in two experimental parts. In first part a detailed study of deposition of PEDOT:PSS from aqueous dispersion using different concentrations of Dimethyl sulfoxide (DMSO) solvent onto glass substrate. Spectroscopic Ellipsometry (SE) in an extended spectral region from the NIR to the Vis-fUV has been implemented to study the optical properties and to estimate the theoretical electrical conductivity of PEDOT:PSS films. Van der Pauw has been used also, to measured the d.c conductivity. The estimated theoretical conductivity was compared with the measured.

Moreover, the effect of the temperature and the duration of the post-annealling have been studied in second part. PEDOT:PSS thin films deposited from aqueous dispersion using 6% concentration of Dimethyl sulfoxide (DMSO) solvent onto glass substrate. Real-time Spectroscopic Ellipsometry from the near infrared to the visible and far ultraviolet spectral region, has been implemented in order to investigate the evolution of the optical, electronic and electrical properties of PEDOT:PSS thin films by the post-deposition thermal annealing, in various temperatures . This information will contribute to the understanding and the optimization of the charge transport mechanisms in the PEDOT:PSS interfaces with the active blend material (bulk heterojunction), towards the fabrication of organic solar cells with enhanced efficiencies.