COMPARATIVE STUDY OF VOLTAMMETRIC, EQCM, AND IN SITU CONDUCTIVITY BEHAVIOUR OF P- AND N-DOPABLE POLYMERS

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A modification of electrically conducting polymers is a promising line of inquiry, which allows one to expand the range of physicochemical characteristics of polymers and produce polymeric materials with new properties. When the 3,4-Ethylenedioxythiophene (EDOT) and thiazole moieties are connected in a donor–acceptor system, the resultant materials will be both p- and n-dopable, and may adopt the π-stacked structures characteristic of the bithiazoles. Thus, we have used successfully Stille coupling reactions to prepare several donor–acceptor–donor type molecule based on 4,4′-dialkyl-2,2′-bithiazole (NBT) and EDOT [1–3], 3,6-Bis(2-thienyl)-N-ethylcarbazole (Th-ECz-Th) [4], 3,6-Bis(2-ethylenedioxythiophenyl)-N-ethylcarbazole (EDOT-ECz-EDOT). The properties of electrochemically obtained polymer films from these monomers were characterized by cyclic voltammetry combined with in situ conductivity, UV–vis spectra, and electrochemical quartz microbalance (EQCM) method. In situ conductivity, EQCM technique has been successfully used for the study of the different electrochemically active polymers [5,6].

In this study we have reported the comparison of voltametric, in situ conductivity and EQCM results of some p- and n dopable polymers. The results give more insight into the structure–property relationship of these novel donor–acceptor type polymers as well as into the mechanism of conduction within these species.

![Figure 1. UV–vis spectra of P(EDOT-NBT-EDOT) film in 0.1 M TBAPf6 in DCM at different oxidation potentials from the range −0.4 to 1.1V; (b) cyclic voltammogram and the change of absorbance at the wavelength corresponding to isosbestic points as a function of potential; (c) differential spectra (A−A0) vs. λ obtained from the data of (a) for the potential range from −0.3 to 0.5 V. A0 is the absorbance at the potential −0.4 V; (d) cyclic voltammogram and the change of absorbance as a function of potential at three wavelengths: 600, 856, and 1100 nm. The plots presented in (b) and (c) were obtained from the data of (a).](image)

References