

Synthesis and Characterization Of Conductive Polyaniline- Graft-Acrylic- Copolymers

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In recent years, intrinsic electrically conductive (ICP) polymers have been studied because of their applications have demonstrated to be changed over the full range from an insulator to a metallic conductor. [1]. Polyaniline (PAni) is one of the most intensively investigated ICPs due to its environmental stability, low cost of raw materials and ease of synthesis [2]. However, as in other ICPs PAni is insoluble, infusible and almost non-processable, which makes difficult its potential application. Its properties such as processability, solubility, spectroscopic and electrochromic properties, can be modified and improved by suggested methods [3,4,5]. In the presented work was aimed to obtain copolymers of Polyaniline with the maintenance of the electrical conductivity in its thin films. Firstly, styrene sulfonate of PAni (PAni-SSA) synthesis, via oxidative polymerization pathway, and secondly, the synthesis of the graft copolymers of PAni, were studied. The morphology of PAni-SSA and the three copolymers was characterized by Scanning Electron Microscopy (SEM) for studies. Synthesis of PAni-SSA and graft copolymers of PAni-SSA by free radical pathway through emulsion polymerization technique, permitted to achieve the particle size ~30 nm. The thickness of the films which were deposited on to glass slides were also measured by SEM by inclining them 45°. As seen in Fig. 1 the materials were deposited on the glass slides in nanometric thickness.

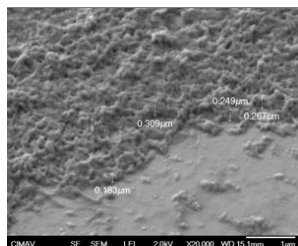


Fig. 1. Morphology and thickness of the (BuA-co-MAA)-g-PAni film.

The depositions were studied by Electrochemical Impedance Spectroscopy (EIS) and Cyclic Voltammetry (CV) to characterize the electrochemical behaviour of the thin films, which were deposited on ITO slides. As shown in the Fig. 2, electrochemical activities of the materials were in the following order: PAni-SSA>(BuA-co-MAA)-g-PAni-SSA>(BuA-co-MMA-co-MAA)-g-PAni-SSA>(MMA-co-MAA)-g-PAni-SSA.

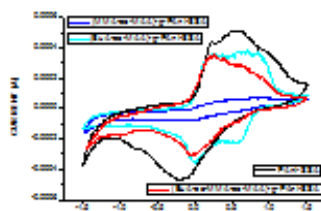


Fig. 2. Cyclic voltammogram of the PAni-SSA and PAni copolymers at a potential scanning rate of 25 mV s⁻¹

As a conclusion; the objective of the study which based on maintenance the electrical conductivity of the PAni in its copolymers and also in the form of thin films realized successfully.

[1]Morrin A. *et al.*, Electrochem Commun 7 (2005) 317

[2] Erdem E. *et al.*, Eur Polym J 40(4) (2004) 785–91

[3] Hua F. and Ruckenstein E., Macromolecules 37 (2004) 6104

[4] Jeevananda T. *et al.*, Synthetic Metals 140 (2004) 247-260

[5] Patil A.O *et al.*, Polym. Prepr. 3 (1990) 456

