

Preparation and characterization of conducting polymer composite films: polypyrrole and Polyethylene

ABSTRACT

Polypyrrole-poly ethylene glycol (Ppy-PEG) composites were synthesized by electrochemical method using *p*-toluene sulfonate as a dopant in aqueous medium. Polyethylene glycol was used as the insulating material in order to impart enhanced mechanical properties to the conducting polymer composite films. The composite films were synthesized with various percentages of PEG, and were characterized by FT-IR spectroscopy, conductivity measurement, optical microscopy (OP), X-ray diffraction (XRD) and dynamic mechanical analysis (DMA). The FT-IR result reveals the successful incorporation of PEG into the polypyrrole structure forming Ppy-PEG composite films. The conductivity of the composite films prepared from using 0.20% PEG was found to exhibit the highest conductivity (61.28 S \cdot cm $^{-1}$) among all the prepared composite films measured at room temperature. The optical microscopy of Ppy-PEG shows the globular surface morphology. The XRD analysis of Ppy-PEG composite films shows that the composite films are amorphous. The enhanced mechanical properties of the Ppy-PEG composite films are the direct consequence of incorporating PEG in the polypyrrole structure.

Keyword: Polypyrrole, polyethylene glycol, electrochemical method, *p*-toluene sulfonate