Morphological and Electrochemical Impedance Spectroscopy (EIS) Study of poly(3,4 ethylenedioxythiophene)-coated poly(acrylonitrile-*co*-styrene) nanoparticles

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The nanoparticles of Poly(3,4-ethylenedioxythiophene)-coated Poly (acrylonitrile-*co*-styrene) (P(AN-*co*-St)/PEDOT) were successfully synthesized via a one-pot micro emulsion polymerization process. Ammonium persulfate (APS) and sodium dodecyl sulfate (SDS) were used to carry out the free-radical polymerization of P(AN-*co*-St) and the oxidative polymerization of 3,4-ethylenedioxythiophene (EDOT) monomer in microemulsion media. SEM, AFM, ATR-FTIR, UV-Visible were used to characterize their morphology and structure. High magnification SEM images of PEDOT-coated P(AN-*co*-St) nanoparticles obtained 25-65 nm. The results of ATR-FTIR and UV-visible spectrum revealed that the P(AN-*co*-St) nanoparticles are covered by PEDOT in the doped state. Electrochemical Impedance Spectroscopy (EIS) was used to indicate electrochemical performances of nanoparticles with time evolution. The electrochemical impedance spectroscopy data were fitted with Electrical Circuit Model of R(C(R(Q(R))))(CR) which gives a good correlation between the calculated and the experimental values. P(AN-*co*-St)/PEDOT nanoparticles exhibit capacitive behaviour similar to that of homo-PEDOT nanoparticle.

Keywords: Electrochemical impedance, Equivalent circuit model, Microemulsion polymerization; Nanocomposite; Poly(3,4-ethylenedioxythiophene).

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