Conducting Polymer-Based Electrode with Magnetic Behavior: Electrochemical Synthesis of Poly(3-thiophene-acetic-acid)/Magnetite Nanocomposite Thin Layers, Janaky C, Visy C, Berkesi O, Tombacz E, JOURNAL OF PHYSICAL CHEMISTRY C, 113 (2009) 1352-1358.

Abstract

Polythiophene- magnetite composite layers have been prepared through the electropolymerization of 3-thiophene-acetic-acid in the presence of Fe_3O_4 nanoparticles in nitrobenzene. Stabilization of magnetite in this organic medium could be achieved by the reaction between surface -OH groups of the narroparticles and the -COOH function of the monomers. Fourier transformed infrared spectroscopic (FT-IR) measurements evidenced the chemisorption of the monomer on the Surface of the narroparticles. By modifying the amount of iron-oxide in the polymerization solution, the inorganic material content of the layer could be increased up to 80 m/m%. Electrochemical results, including data obtained by electrochemical quartz crystal microbalance (EQCM), proved that the presence of Fe_3O_4 did not influence the redox properties of the polymeric film. In the presence of magnetite, an extraordinary microstructure can be detected, where the self-assembling magnetic component strongly determines the morphology of the composite, leading to band formation of similar to 1 μm width. This new modified electrode, incorporating such a large amount of Fe_3O_4 may be used in magnetic electrocatalysis.