

Electrochemical characterization of the redox couple of [Fe(CN)₆]³⁻/[Fe(CN)₆]⁴⁻ mediated by a grafted polymer modified glassy carbon electrode.

ABSTRACT

A glassy carbon electrode (GCE) was modified with a grafted polymer GP film (polystyrene grafted with acrylonitrile as a monomer using gamma irradiation) using a solution evaporation method to produce a new modified electrode GP/GCE. The redox process of K₃[Fe(CN)₆] during cyclic voltammetry was studied using the GP/GCE. It was found that the peak separation (ΔE_{pa-c}) between the redox peaks of ferricyanide ion in an aqueous solution is 82mV and the current ratio of redox peaks, (I_{pa}/I_{pc}), is 1 for the GP/GCE, indicating good reversibility with good conductivity of the modified electrode. Hence, it can be used for voltammetric analysis. The physical properties of the modified electrode GP/GCE include good hardness, high adhesion to the metal surfaces of electrode collectors, solubility and good stability of the GP on GCE at different pH levels. Also, the sensitivity under conditions of cyclic voltammetry is significantly dependent on the pH, the electrolyte used and the scan rate. At different scan rates, two oxidation peaks and two reduction peaks of Fe(III) were observed in a reversible process: Fe(III)/Fe(II) and Fe(II)/Fe(0).

Keyword: Cyclic voltammetry; Grafted polymer modified GC electrode; Fe(III)/(II) redox couple, Electrocatalysis.