

Electrochemical behavior and characterization of grafted polystyrene-acrylonitrile electrodes.

ABSTRACT

The redox of grafted polymer electrodes GPE (grafted polystyrene-acrylonitrile, GP15%, GP45% and GP50% grafting percentage) in aqueous electrolyte has been studied under various voltammetric conditions. In this work, voltammetric studies were carried out, principally in electrolyte containing potassium chloride. It was observed that GP15% has a good potential window at -2.0 - +2.0V without any current peak, while GP45% has reduction and oxidation current peaks at -175.9 and +210mV respectively. Also GP50% has oxidation and reduction current peaks at +263.1 and -261.9mV respectively. The redox process is irreversible in aqueous electrolyte containing different alkaline cations, such as Na⁺, K⁺, Rb⁺ and Cs⁺. The shift of redox potential was found to follow the change in the hydration energy in the order: Cs⁺ > Rb⁺ > K⁺ > Na⁺. In addition, the redox peaks of the fabricated electrodes from GP were also studied in aqueous electrolytes at different anions (KCl, KClO₄, K₂HPO₄, KNO₃ and K₂SO₄), which gave good redox peaks in KCl and enhanced the redox current via increasing the concentration. Electrochemical experiments reveal that the grafted polymer electrodes show improved electron-transfer characteristics and exhibit high electrocatalytic activity for grafted percentage in the order of : 15% > 45% > 50%. The applications of these electrodes, especially type 15%, are in the cyclic voltammetric technique when used as a working electrode.

Keyword: Grafted polymer electrode; Cyclic voltammetry; Electrocatalyst; KCl electrolyte.