Electrochemical Evaluation of Membranes of poly-[styrene-co-acrylic acid] for use in PMFC

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ABSTRACT

Nanotechnology allows to create and implement materials, structures and systems by mounting and manipulating in atomic and molecular scale. New effects observed on the nanometer scale are explored in this study for the development of membranes for application in fuel cells (PMFC). It has been observed that the incorporation of metal nanoparticles of gold, silver, among others, in polymeric matrices increases the thermal stability of the membranes. This is desirable since the catalytic activity of the catalysts employed in cells is associated with operating temperature. In this study we report the preparation and electrochemical characterization of polymeric membrane of poly-[styrene-co-acrylic acid] sulfonated for application in PMFC. Poly-[styrene-co-acrylic acid] was prepared in the ratio 92:8, followed by sulfonation with H_2SO_4. Electrodes of Pt//poly-[styrene-co-acrylic acid] sulfonated were prepared by slow evaporation from a polymer solution deposited on its surface. The polymer films were characterized by cyclic voltammetry and electrochemical impedance spectroscopy in acidic and neutral media environment. Cyclic voltammograms were recorded in solutions 0.5 mol.dm^{-3} and revealed the presence of redox processes attributed to the H^+ ions. The thermal stability was evaluated by TGA and the microstructural characterization conducted by atomic force microscopy.

Keywords: Electrochemistry; metal nanoparticles; fuel cells