

Electrochemical Studies of Poly(styrene-co-acrylic acid) PEM Membranes Synthesized by two different Methods

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ABSTRACT

The synthesis of two alternatives to Nafion random copolymers was carried out by radical copolymerization. Poly(styrene-co-acrylic acid) (PSAA) in a 94:6 styrene-acrylic acid molar relation, partially cross-linked with trimethylol propane trimethacrylate (TMPTMA) was synthesized by mass polymerization. The PSAA obtained was sulfonated (PSAAS-m) with sulphuric acid, considering the 100 % molar substitution of styrene benzene rings. Separately, same random PSAA was synthesized by solution polymerization, but cross-linked with Divinylbenzene (DVB) and sulfonated (PSAAS-s) with acetyl sulphate at a 20 % molar substitution with respect to benzene rings. Copolymers, including non sulfonated blanks, were dissolved in THF and used to coat a platinum (Pt) electrode by "deep coating" and studied electrochemically by the voltamperometric cycle technique in H₂SO₄ 0.5 M. Both non-sulfonated PSAA copolymers showed only a baseline signal, indicating no proton conductivity through them. Similarly was observed for the PSAAS-s copolymer, suggesting no proton conductivity as well. On the other hand, the copolymer synthesized in mass and highly sulfonated (PSAAS-m) showed the corresponding signals of Pt reduction, as observed in the experiment carried out for the Pt electrode without any coating.

Keywords: sulfonated PSAA , fuel cells, Pt electrode.

