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Syntheses and Characterization of Radiation-Grafted Poly(Ethylene-Co-Tetrafluoroethylene) Films as Electrolyte for Alkaline Fuel Cells

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Anion Exchange membranes (AEMs) are a promising alternative to the development of more efficient electrolytes for alkaline fuel cells. In general, the AEMs are ionomeric membranes able to conduct hydroxide ions (OH-) due to quaternary ammonium exchange groups, which confer to AEM high pH equivalent [1]. In order to develop alkaline membranes for fuel cells applications, poly(ethylene-co-tetrafluoroethylene) (ETFE) pre-irradiated by using electron beam and stored at low temperature (-70 ºC) as a function of time (up to ten months) have been synthesized by styrene-grafting, and functionalized with trimethylamine to introduce quaternary ammonium groups [2,3]. The resulting membranes were characterized by electron paramagnetic resonance (ERS), thermogravimetry (TG) and electrochemical impedance spectroscopy. The determination of grafting degree and water uptake were conducted by gravimetry and ion exchange capacity by titration. Results have shown that styrene-grafted ETFE membranes, pre-irradiated at 70 kGy and stored at low temperature (-70 ºC), up to ten months, showed ionic conductivity results, in hydroxide form (OH-), of 80 mS.cm-1 at 60 ºC. Such results have demonstrated that ETFE-based AEMs are promising electrolytes for alkaline fuel cell applications.

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Evaluation of the Influence of the Humidity Content of the Adsorbents used in the Treatment of Petroleum Derivatives

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