

Development and Characterization of a Polymer Composite Electrolyte to Be Used in Proton Exchange Membranes Fuel Cells

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Abstract : The Proton Exchange Membranes (PEM) are largely studied because they operate at low temperatures and they are suitable for mobile applications. However, There are some deficiencies in their operation, Mainly those that use ethanol as a hydrogen source that require a certain attention. Therefore, This research aimed to develop Nafion® composite membranes, Mixing clay minerals, Kaolin and halloysite to the polymer matrix in order to improve the ethanol molecule retentions and at the same time to keep the system's protonic conductivity. The modified Nafion/Kaolin, Nafion/Halloysite composite membranes were prepared in weight proportion of 0.5, 1.0 and 1.5. The membranes obtained were characterized as to their ethanol permeability, Protonic conductivity and water absorption. The composite morphology and structure are characterized by SEM and EDX and also the thermal behavior is determined by TGA and DSC. The analysis of the results shows ethanol permeability reduction from 48% to 63%. However, The protonic conductivity results are lower in relation to pure Nafion®. As to the thermal behavior, The Nafion® composite membranes were stable up to a temperature of 325°C.

Keywords : Polymer-matrix composites (PMCs), thermal properties, nanoclay, differential scanning calorimetry

Conference Title : ICSREE 2014 : International Conference on Sustainable and Renewable Energy Engineering

Conference Location : Paris, France

Conference Dates : December 30-31, 2014