



## Synthesis and characterization of new membranes deriving from sulfonated polyethersulfone for PEMFC applications

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### ABSTRACT

Two new types of proton exchange membranes used in proton exchange membrane fuel cell (PEMFC) were synthesized from sulfochlorinated polyethersulfone (PES (polyarylethersulfone)-SO<sub>2</sub>Cl). One, called S-PESB, was obtained by grafting butylphenol in an amount of 0.3 equivalent per monomer unit. The second (S-PESTD) was prepared by cross-linking with 0.1 equivalent of 4,7,10-trioxa-1,13-tridecandiamine. Analysis of thermal properties (thermo-gravimetric analysis and DSA) and mechanical testing (dynamical and thermomechanical analysis) of the two membranes showed a significant improvement in comparison with unmodified polyethersulfone sulfonic acid (S-PES). Thus, a significant lowering of the glass transition temperature was observed. In addition, a comparative study carried out with the commercial Nafion<sup>®</sup> membrane gave very similar values of ionic conductivity and a high selectivity of proton transport. A preliminary electrochemical study of membrane/electrode assembly has shown that the elaborated membranes are promising in PEMFC application. Power densities obtained with cross-linked S-PESTD were superior to those of commercial Nafion<sup>®</sup>, while S-PESB led to comparable values.

*Keywords:* Fuel cell; Proton exchange membrane; Sulfonated polyethersulfone

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