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Poster Number	Name	Session	Title
6AEM	Naima Naffati, Fátima C. Teixeira, António P. S. Teixeira, C. M. Rangel	AEM	Chitosan doped membranes for electrochemical devices

Chitosan doped membranes for electrochemical devices

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INTRODUCTION

The development of new proton exchange membrane (PEM) for electrochemical devices, such as fuel cells and electrolyzers, have attracted researcher's attention in the pursuit for more sustainable and cost-effective technologies for clean energy production, being extensive those for CO_2 reduction and conversion[1,2]. To this end, in the present work, new modified chitosan (CS) membranes doped with ionic liquids (ILs) were developed to perform as PEM at those electrochemical devices, as an alternative to widely used commercial Nafion, with several advantages such as wider availability, lower cost, biodegradability and thermal stability. These modified membranes for use in electrochemical devices are expected to show suitably enhanced ion conductivity and also improved mechanical strength associated to a decrease in water uptake.

EXPERIMENTAL

The chitosan powder (CS) (medium molar mass and 75–85% deacetylation degree) and glycerol (Gly), used as a plasticizer agent, were purchased from Sigma-Aldrich. Membranes were prepared by casting chitosan/IL solutions with 50% and 33% of [EMIM][OTf], 33% of [EMIM][NTf_2], and 10% of [MIMH][HSO_4] (Fig.1). Characterization was done by ATR-FTIR spectroscopy (Perkin Elmer spectrometer) and proton conductivity was evaluated by electrochemical impedance spectroscopy (EIS) (Solartron 1250 FRA), using a BekkTech conductivity cell under controlled temperature and relative humidity (RH) conditions.

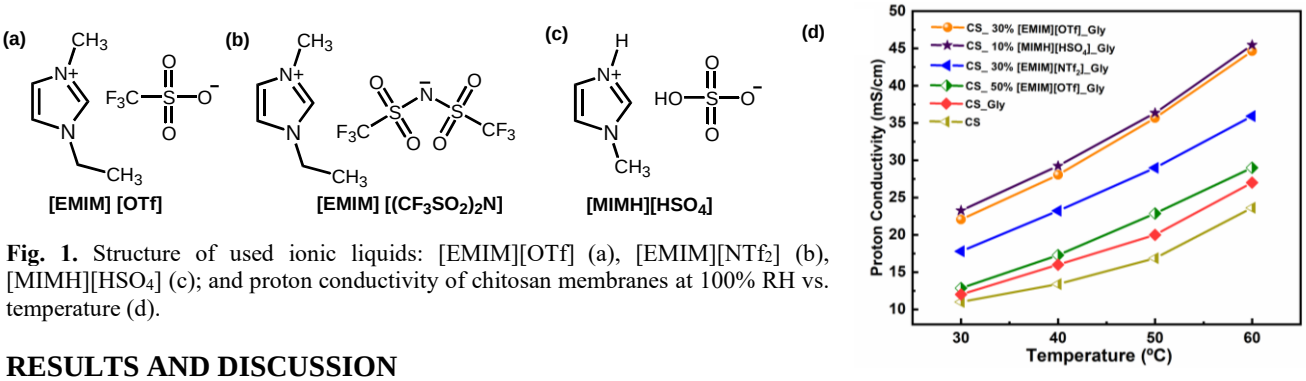

Fig. 1. Structure of used ionic liquids: [EMIM][OTf] (a), [EMIM][NTf_2] (b), [MIMH][HSO_4] (c); and proton conductivity of chitosan membranes at 100% RH vs. temperature (d).

RESULTS AND DISCUSSION

New chitosan membranes were prepared by casting with the incorporation of ILs as dopants, and analyzed by ATR-FTIR. EIS assessment of the doped membranes indicated that the incorporation of IL modifies their proton conduction. At 100% RH, all doped membranes showed a significant increase in the proton conductivity, which rises with the increase of temperature, compared to the pristine CS membrane. The best proton conductivity, 45 mS/cm, was observed for membrane CS_[MIMH][HSO_4]_Gly with 10 wt% of loading at 60 ºC (Fig. 1).

CONCLUSION

New modified chitosan membranes were obtained by casting with ILs as dopants, showing higher proton conductivity than pristine chitosan membrane at 100% RH. Results confirm that these membranes are a promising material for electrochemical devices.

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