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New SPEEK Membranes Modified with Bisphophonate Dopants

Fátima C. Teixeira,[a] António P. S. Teixeira,[b,c] C. M. Rangel[a]

[a] *Laboratório Nacional de Energia e Geologia, I.P., Lisboa, Portugal.* [b]*University of Évora, School of Health and Human Development, Department of Medical and Health Sciences, Rua Romão Ramalho, 59, 7000 Évora, Portugal.* [c]*University of Évora, Institute for Research and Advanced Training (IIFA), LAQV-REQUIMTE, Rua Romão Ramalho, 59, 7000 Évora, Portugal.*

Email: fatima.teixeira@lneg.pt, apsteix@uevora.pt

Sustainable emerging energy technologies are pivotal to a decarbonized society that still continuously increases its energy demands. Fuel cells and eletrolyzers are part of these promising sustainable technologies, but they still depend on several factors, especially on their membranes. These are a key component acting as a separator, between their different materials and electrolytes of different devices' compartments, and as a selective ion-exchange barrier, controlling the ion flow and species permeability. Sulfonated poly(etheretherketone) (SPEEK) polymer is a versatile non-fluorinated alternative, as a low-cost and more environmentally friendly membrane, to the most commercially successful membrane based on the perfluorinated sulfonic Nafion®. Also, our previous studies showed that the incorporation of BPs dopants into the polymeric matrices, modifies the properties of the doped membranes, including their proton conduction and durability.[1-5]

Following these results, a set of diverse bisphosphonates were prepared from different synthetic strategies (**Figure 1**) and characterized by NMR, IR and mass spectrometry. The SPEEK polymer was prepared by a sulfonation reaction from poly(etheretherketone) (PEEK), to afford a polymer with a sulfonation degree of 57%. The new dopants were incorporated by a casting method into SPEEK matrices to obtain the new modified membranes. The doped membranes were analyzed by NMR and ATR-FTIR spectroscopy and their proton conductivity was assessed by electrochemical impedance spectroscopy (EIS) at different temperatures, ranging from 30 to 60 ºC, under 100% RH conditions.

Membrane properties were compared with those of a pristine SPEEK membrane, tested in the same experimental conditions, to assess the potential of the new membranes, addressing key challenges in today´s membrane technology.

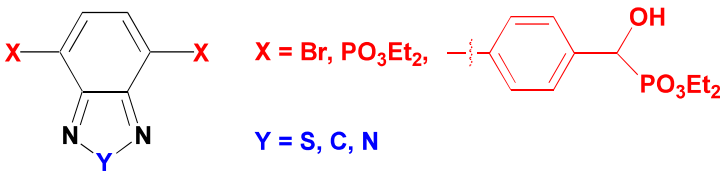

Figure 1: General stucture of bisphosphonate dopants.

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