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Synthesis and characterization of DABCO-functionalized polysulfones as anion-exchange membranes for fuel cells applications

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In the near past decades, there has been increasing interest in the development of anion-exchange membrane fuel cells (AEMFCs) because of their advantages such as faster oxygen reduction reaction kinetics or desirable applicability of non-precious metals as catalyst compared to proton-exchange membrane fuel cells (PEMFCs). Anion-exchange membranes (AEM) are one of the key components in a fuel cell. Polysulfone derivatives are considered as good candidates for the preparation of this type of materials. The efficiency of the AEM can be discussed in terms of polymeric backbone, responsible for the mechanical properties and also the anion-exchangeable group. In this work, 1,4-diazabicyclo[2,2,2]octane (DABCO) was used as quaternization agent and a series of DABCO-functionalized polysulfones were prepared. In the DABCO structure the impossibility to reach an antiperiplanar conformation minimizes the Hofmann elimination. In addition, the presence of two nitrogen atoms in the rings can stabilize the positive charge, preventing the polymer degradation. Thus, the resulting membranes showed high thermal stability for typical fuel cell operation temperatures below 100°C and good alkaline stability after being treated in a 1M KOH solution for 96 h. When DABCO groups were inserted into the polymer backbone, the glass transition temperature of the functionalized membranes increased due to the incorporation of bulky substituents which decreases the mobility of the polymer chain. The ionic conductivity of these membranes is the same order of magnitude that of AEMs commonly used for this purpose. Therefore this material could be used as solid electrolyte in low temperature fuel cells.

Biography

María Teresa Pérez Prior received her PhD in Chemistry from the University of Salamanca. She did a stage at the Fakultät für Chemie, Ruhr-Universität Bochum, Germany and a Post-doctoral stage at the Polytechnic School of Albacete, University of Castilla-La Mancha. She currently serves as Lecturer in the department of Materials Science and Engineering and Chemical Engineering at the University Carlos III of Madrid. In recent years, her main research is focused in the synthesis and characterization of polymeric materials for energy applications.

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