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Highly KOH Doped para-Polybenzimidazole Anion Exchange Membrane and its Performance in Pt/Ti_nO_{2n-1} Catalyzed Water Electrolysis Cell

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Abstract

In this study we report the preparation and properties of KOH doped para-polybenzimidazole membrane as anion conducting polymer electrolyte for application in water electrolysis cell. The membrane demonstrated an outstanding OH⁻ conductivity measured by electrochemical impedance spectroscopy, which depending on the relative humidity varies in the range 298 to 1140 mS.cm⁻¹. The membrane electrode assembly prepared with this membrane and a novel non-carbon supported Pt catalyst were tested in a single electrolysis cell at close to real operation conditions both at room and at 80°C. The results obtained showed low overpotentials concerning both partial reactions and a stable electrochemical performance at cell voltage of 2.2 V. The enhanced efficiency of the electrolysis has been attributed to the combined effects of the high membrane conductivity, the homogeneous distribution and small size of the catalytic particles, and the corrosion resistance of the selected catalyst support.

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