Phosphoric acid doped membranes based on Nafion®, PBI and their blends – Membrane preparation, characterization and steam electrolysis testing - DTU Orbit (30/11/2018)

Proton exchange membrane steam electrolysis at temperatures above 100 °C has several advantages from thermodynamic, kinetic and engineering points of view. A key material for this technology is the high temperature proton exchange membrane. In this work a novel procedure for preparation of Nafion® and polybenzimidazole blend membranes was developed. Homogeneous binary membranes covering the whole composition range were prepared and characterized with respect to chemical and physiochemical properties such as water uptake, phosphoric acid doping, oxidative stability, mechanical strength and proton conductivity. An MEA based on phosphoric acid doped Nafion® was operated at 130 °C at ambient pressure with a current density of 300 mA cm−2 at 1.75 V, with no membrane degradation observed during a test of 90 h. The PBI based MEAs showed better polarization curves (500 mA cm−2 at 1.75 V) but poor durability.

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