Nanostructuring approach in developing polymer membranes for advanced energy conversion devices

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In alternative energy devices the medium temperature polymer electrolyte membrane (PEM) fuel cells are of growing importance. It resulted in rising interest in field of ionic liquids as components for polymer membranes due to higher temperature (100-200^{o}C) and electrochemical stability [1].

Acidic ionic liquids synthesized and examined in this paper include 3-(1-pyridinio)-1-propanesulfonate [PyPS] hydrogen sulfate (1a), dihydrogen phosphate (1b) and p-toluenesulfonate (1c), 3-(1-methyl-3-imidazolio)-1-propane¬sulfonate [MeImPS] hydrogen sulfate (2a), dihydrogen phosphate (2b) and p-toluenesulfonate (2c) as well as 3-(1-butyl-3-imidazolio)-1-propane¬sulfonate [BuImPS] hydrogen sulfate (3a), dihydrogen phosphate (3b) and p-toluenesulfonate (3c) [2]. Phosphorized zirconium oxide nanoparticles prepared according following synthesis procedure [3]. Ionic liquid and nanoparticle composites with SPEEK membranes have been obtained by casting and impregnation. Structures of ionic liquids obtained in this work have been determined by ^{1}H NMR and XRD, but water content by Karl Fischer method. Thermal stability of ionic liquids and membranes was controlled by thermogravimetry analysis. Conductivity was obtained from impedance measurements using Autolab set-up in temperature range 20-120^{o}C. Nanostructuring is important for stabilizing mechanical properties, which are crucial for application in energy devices [4].

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References

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