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Fuel cell based on novel hyper-branched polybenzimidazole membrane

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Abstract

A novel hyper-branched polybenzimidazole (HB-PBI) has been synthesized and efficiently utilized as a conducting polymer for the fabrication of an efficient high temperature fuel cell. The developed fuel cell showed outstanding proton conductivity (0.168 Scm(-1) at 150 A degrees C) along with excellent single cell performance, displaying a maximum power density of 0.346 Wcm(-2). The HB-PBI has been synthesized by polymerization of bibenzimidazole diterephthalic acid (BBIDTA) and 3,3'-diaminobenzene in the presence of poly phosphoric acid while the BBIDTA was synthesized by treating trimellitic anhydride with 3,3'-diaminobenzene. Both HB-PBI and BBIDTA were structurally characterized by nuclear magnetic resonance (H-1 and C-13 NMR). HB-PBI showed high thermal stability and mechanical properties, findings that were corroborated by thermogravimetric analysis and use of a universal testing machine. Additionally, proton conduction and the thermal and mechanical properties of HB-PBI were compared with polybenzene imidazole (m-PBI), and found that HB-PBI has higher proton conducting, thermal and mechanical properties.

Keywords

Author Keywords: polybenzimidazole; proton exchange membrane; fuel cell; thermal properties; mechanical properties

KeyWords Plus: COPOLYMER COMPOSITE MEMBRANES; POLYMER ELECTROLYTE MEMBRANES; ACID DOPED POLYBENZIMIDAZOLE; SULFONATED POLYIMIDE; METHANOL; PERFORMANCE; STABILITY; NETWORKS; HYDROGEN

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