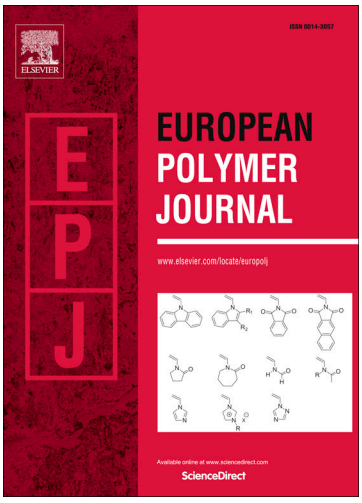

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Radiation grafting graphene oxide reinforced polybenzimidazole membrane with a sandwich structure for high temperature proton exchange membrane fuel cells in anhydrous atmosphere

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Abstract:

A three-layer membrane (TLM) of radiation grafting graphene oxide reinforced polybenzimidazole/porous polybenzimidazole/radiation grafting graphene oxide reinforced polybenzimidazole (PBI-RGO/PPBI/PBI-RGO) was fabricated and then doped with phosphoric acid (PA) for high temperature proton exchange membranes (HT-PEM). These TLMs have a sandwich structure and the diameter of most pores falls in the range between 500 nm and 2 μm. PA doped TLMs display excellent mechanical strength and oxidative stability. The tensile strength of PA doped PBI-RGO/PPBI/PBI-RGO membranes ranges from 22.7 to 38.5 MPa, which is significantly higher than that of PA doped PPBI membrane (7.9 MPa). The introduction of RGO and the porous structure could improve the proton conductivity of membranes. The proton conductivity of PA doped PBI-RGO/PPBI-80/PBI-RGO membrane is 113.8 $mS \cdot cm^{-1}$ at 170°C without humidity, with an increase of 4.9 times compared with that of PA doped PBI membrane. The sandwich structure endows the