

Preparation of Post and Block Sulfonated PEEK/BPO₄ Composite Membranes for Fuel Cell Applications

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To investigate the effect of proton conductivity on the degree of sulfonation and its preparation methods, sulfonated poly(ether ether ketone) (SPEEK)/BPO₄ composite membranes were prepared via a sol-gel process. Two types of sulfonation methods were adopted: i) post-sulfonation; ii) direct block copolymerization. Both types of polymers were used as a matrix of the inorganic (i.e., BPO₄). The prepared membranes were characterized in terms of proton conductivity, TGA, AFM, TEM and SAXS. Proton conductivity of the SPEEK and composite membranes increased with temperature. The conductivity of the composite membranes was much higher than that of the plain SPEEK membranes due to the bicontinuous channel formation via both sulfonic acid group and solid proton conductor. Compared with the post sulfonated PEEK/BPO₄ composite membranes, the block sulfonated PEEK/BPO₄ membranes had higher conductivity at similar water content. The composite membranes based on block copolymerization were much favorable for fuel cell applications.