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论文

新型直接交联磺化聚芳醚砜燃料电池用质子交换膜的合成及性能

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摘要:

以4,4′-二氟二苯砜、4,4′-联苯二酚、3,3′-二磺化-4,4′-二氟二苯砜二钠盐和三羟基苯为原料, 经高温溶液缩聚反应, 制备了一系列不同磺化度的新型交联磺化聚芳醚砜(CSPAES). 利用^{1}H NMR和FTIR对聚合物结构进行表征. 采用溶液浇铸法制备了聚合物膜. 对膜的离子交换容量、吸水率、尺寸变化、机械性能和质子导电率进行了分析. 结果表明, 通过交联处理的磺化聚芳醚砜的水溶胀性明显降低, 当IEC为2.43时, CSPAES膜M(6/4-5)在水中的质子导电率达到260.5 mS/cm, 约为相同条件下Nafion112的2倍.

关键词: 交联; 磺化聚芳醚砜; 质子交换膜; 水溶涨性; 燃料电池

Syntheses and Properties of Directly Crosslinked Sulfonated Poly(arylene ether sulfone)s for Proton Exchange Membrane Fuel Cells

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Abstract:

A series of crosslinked sulfonated poly(arylene ether sulfone)s were synthesized from 4,4′-difluorodiphenyl sulfone(DFDPS), 4,4′-biphenol(BP), 3,3′-disulfonate-4,4′-difluorodiphenyl sulfone (SDFDPS) and 1,3,5-trihydroxy benzene(THB) by nucleophilic substitution polycondensation reactions. The trifunctional crosslinker of THB was in the mass fraction range of 3%—7%. The structures of the polymers were confirmed by ^{1}H NMR and FTIR. The membranes were obtained by solution casting. The properties of the membranes including the ion exchange capacity(IEC), water uptake, diamensional change, mechanic property and proton conductivity were investigated. The results show that the water swelling is decreased after the cross-linking treatment. For the CSPAES membrane of M(6/4-6), with IEC of 2.43 meq/q, it show proton conductivity of 260.5 mS/cm in water at 60 ℃, which is almost twice to that of Nafion 112.

Keywords: Crosslink; Sulfonated poly(arylene ether sulfone); Proton exchange membrane; Water stability; Fuel cell

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