20th International Conference on
Emerging Materials and Nanotechnology
June 25-26, 2018 | Vancouver, Canada

# Synthesis and characterization of partially fluorinated sulfonated poly(arylene ether)s electrolytes for proton exchange membrane fuel cell

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The proton exchange membrane (PEM) play an important role in a polymer electrolyte membrane fuel cell (PEMFC). There are several requirements for PEM materials, e.g., high proton conductivity, low oxidative stability, thermal and good mechanical properties. In this work, trifluoromethyl groups had been introduced on polymer backbone and phenyl side chain. It can provide densely located sulfonic acid group substitution and also promotes solubility, oxidative stability and thermal. This study designed two kinds of random copolymerization of aromatic ether polymer, monomer containing commercial monomer Bisphenol A and Bisphenol AF synthesis of monomers. 4,4””-difluoro-3,3””-bistrifluoromethyl-2”,3”,5”,6”-tetraphenyl [1,1’;4’,1”;4”,1’”; 4’”,1””]-pe-ntaphenyl and 4,4””-difluoro-3,3”” bis(trifluoromethyl)- 2",3",5",6",4,4””-difluoro-3,3””-bis(trifluoromethyl) 2",3",5",6",-Tetra-(trifluoromethyl)phenyl-[1,1':4',1":4",1"':4"',1””-quinqu-ephenyl] The designed chemical structures were confirmed by NMR and FTIR analysis. Two series of sulfonated polyaromatic ether random copolymer SN and SF. SN series proton conductivity of polymer can be as high as 325 mS / cm, water absorption is also high (259% ~ 725%) and dissolves in water at high temperatures (90˚C). SF series of polymer size change rate remained at 10% or less (from 30˚C to 80 ˚C), the proton conductivity of 87 ~ 106 mS / cm. We chose two kinds of SF series as the component measurement. (SF-1.54 and SF-1.75 ) When the fuel cell efficiency is 0.6 V, the current densities are 0.65 A / $cm^2$ and 1.2 A / $cm^2$, and the maximum power densities are 0.51 W / $cm^2$ and 0.87 W / $cm^2$, respectively.

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