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Abstract

Two series of side chain types fluorinated poly(aryl ether) copolymers incorporated with different diphenol monomers were systematically synthesized through nucleophilic substitution reaction. Their structures were characterized by ^{1}H NMR and FTIR. Their fundamental properties for fuel cell applications, including ion exchange capacity, water sorption, density, proton conductivity, mechanical property, thermal as well as oxidative stability are investigated. It is found that the sulfone incorporation in the polymer backbone enhanced the water uptaking capacity while the bulky fluorene incorporation acted reversely, despite of their larger free volume. Similarly, other properties such as mechanical strength, proton conductivity, especially the free volume and density were impacted by the incorporation of different bisphenol-based monomer. SPFAE-ODP membrane displayed good PEM fuel cell performance with a maximum power density of 679 mW cm^{-2} at 80 ^{o}C and 80% relative humidity. Considering its excellent properties and better cell performance, these types of membranes are promising candidates as alternatives to perfluorosulfonic acid membranes for future polymer electrolyte membrane fuel cell applications.