

Sulfonated Poly(ether ketone ketone) Ionomers as Proton Exchange Membranes

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Sulfonated poly(ether ketone ketone) ionomers (SPEKK) with ion-exchange capacities (IEC) between 0.2 and 3.4 meq/g were prepared by sulfonating PEKK with a mixture of concentrated and fuming sulfuric acids. Sulfonation occurs only on the phenyl rings attached to ether and ketone groups. The glass transition temperature of the dry SPEKK ionomers increased linearly with increasing IEC, and the ionomers were thermally stable to $\sim 250^{\circ}\text{C}$, above which desulfonation occurred. Water-swollen ionomers exhibited microphase separated morphologies, and the average correlation length determined by small angle X-ray scattering increased with increasing IEC. The proton conductivity of hydrated SPEKK membranes measured by impedance spectroscopy ranged from $\sim 10^{-3}$ to 10^{-1} S/cm as the IEC increased from ~ 1.0 to 2.4 meq/g. Single cell performance curves on membrane-electrode assemblies (MEA) indicated that the SPEKK membranes approached the performance of NafionTM for an IEC of 2 meq/g. POLYM. ENG. SCI., 45:1081-1091, 2005. © 2005 Society of Plastics Engineers