Enhancing the phase segregation and connectivity of hydrophilic channels by blending highly sulfonated graft copolymers with fluorous homopolymers

The influence of tuning the ionic content of membranes by blending, as opposed to varying the degree of sulfonation, is evaluated. Membranes of fully sulfonated poly(vinylidene fluoride-co-chlorotrifluoroethylene)-g-poly(styrene sulfonic acid) blended with PVDF were prepared and investigated for morphology, water sorption, and proton transport properties. The blend membranes exhibit conductivities superior to pure graft copolymers under fully humidified conditions despite their lower water uptake. Transmission electron microscopy images of the blends reveal that the membranes comprise a combination of macro-phase segregated regions of ion-rich and PVDF-rich domains, and, at higher PVDF contents, ion-rich nano-scale domains within fluorine-rich domains. © 2013 The Royal Society of Chemistry.