

One-pot Synthesis of Proton Conducting Poly(vinylidene fluoride) Graft Copolymer Electrolytes

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The single-step synthesis of proton conducting poly(vinylidene fluoride) (PVDF) graft copolymer electrolytes is demonstrated. The graft copolymers of PVDF backbone with poly(sulfopropyl methacrylate) (PVDF-g-PSPMA) and poly(styrene sulfonic acid) (PVDF-g-PSSA) were synthesized using PVDF as a macroinitiator for atom transfer radical polymerization (ATRP). ¹H NMR and FT-IR spectroscopy show that the "grafting from" method using ATRP was successful and the maximum grafting degrees were 35 and 25w% for PVDF-g-PSPMA and PVDF-g-PSSA, respectively. The IEC values were 0.63 and 0.45 meq/g, water uptake were 46.8 and 33.4 w% and proton conductivities were 0.015 and 0.007 S/cm at room temperature, for PVDF-g-PSPMA and PVDF-g-PSSA, respectively. Both membranes exhibited excellent thermal stability up to around 350 °C, verified by thermal gravimetric analysis (TGA).