Thermal, mechanical, swelling, and electrochemical properties of (PVDF-HFP/PEG) hybrid type polymer electrolytes

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Porous PVDF-HFP polymer films were prepared by film casting process. The porosity was controlled by film casting time and PEG concentration. The prepared PVDF-HFP polymer films had high thermal and mechanical stabilities even when large amount of liquid electrolytes was impregnated. The dynamic and equilibrium swelling behavior was controlled by the size and amount of pores. Ion conductivities of PVDF-HFP electrolyte films increased with increasing PEG concentration, as more liquid electrolytes were possibly incorporated. When the absorbed solvent amount was fixed, the maximum ion conductivity was represented when the added Li salt concentration was 1 M. Addition of more Li salt than 1 M might restrict the molecular motion to attain high ion transport. The temperature dependence behavior of ion conductivities of PVDF-HFP/PEG electrolyte systems was linear in logarithmic scale. When the experimental data were shifted by reference temperature, they were well fitted by WLF description. The prepared PVDF-HFP polymer electrolyte composites were stable up to about 5 V.