ABSTRACT:

The introduction of 2,4,6-triaminopyrimidine (TAP) into sulfonated poly(ether ether ketone) (SPEEK)/Cloisite15A® nanocomposite membranes were investigated for the purpose of maintaining low methanol permeability and suppressing swelling in direct methanol fuel cell (DMFC). SPEEK with 63% of degree of sulfonation (DS) was prepared by sulfonation of PEEK. Cloisite15A (7.5 wt %) along with various weight loading of TAP was incorporated into SPEEK matrix via solution intercalation method. The effect of TAP loading on the SPEEK/Cloisite15A/TAP morphology was studied. The beneficial impact of the SPEEK/Cloisite15A/TAP morphology on the physicochemical properties of the membrane was further discussed. Swelling behavior, ion exchange capacity (IEC), proton conductivity, and methanol permeability of the resultant membranes were determined as a function of Cloisite15A and TAP loadings. Uniform distribution of Cloisite15A particles in the SPEEK polymer matrix in the homogenous SPEEK/Cloisite15A/TAP nanocomposite membranes was confirmed by scanning electron microscopy and X-ray diffraction. The water uptake of the SPEEK nanocomposite membranes decreased dramatically in the presence of TAP. The significant selectivity of SP/7.5/7.5 nanocomposite membranes could indicate a potential feasibility as a promising electrolyte for DMFC.