Supplementary Information

Membrane Characterization

The CNIM-SAP membrane was characterized by using scanning electron microscopy (SEM, Leo 1530 VP, Carl Zeiss SMT AG Company, Oberkochen, Germany). This was done by cutting the membranes into 0.5 cm long pieces and coating with carbon films. Fig. 1a, b and c show the SEM images of the surfaces of plain PP substrate, SAP and CNIM-SAP, respectively. Fig. 1b shows a defect free dense layer over the hydrophilized PP support. The wrinkle surface of the CNIM-SAP indicates the presence of CNTs embedded into the polymer matrix. Cross-section of the CNIM-SAP in Fig. 1d clearly shows uniform dispersion of CNTs in the polymer matrix.

The thermal degradation behavior and thermal stability of the CNIM-SAP was studied by thermogravimetric analysis (TGA) using a Perkin-Elmer Pyris 7 TGA system at a heating rate of 10 °C/min under air. The TGA curve of the composite membrane is shown in Fig. 2a. It is clear from the figure that the membrane is quite stable at relatively high temperatures. The TGA curve of the composite membrane showed its first weight loss stage occurring at 275^0C followed by a sharp decomposition at 400^0C. The figure also demonstrates a slight increase in thermal stability for CNIM-SAP membrane due the presence of CNTs in the polymer matrix.

The glass transition temperature (Tg) was measured using a differential scanning calorimetry (DSC) analyzer (model DSC822e, Mettler Toledo, Switzerland). The temperature range for these experiments was 0-250 °C at a scanning rate of 10 °C/min. Fig. 2b shows the DSC curves of the composite membrane. A relatively high glass transition temperature was observed at 237^0C.

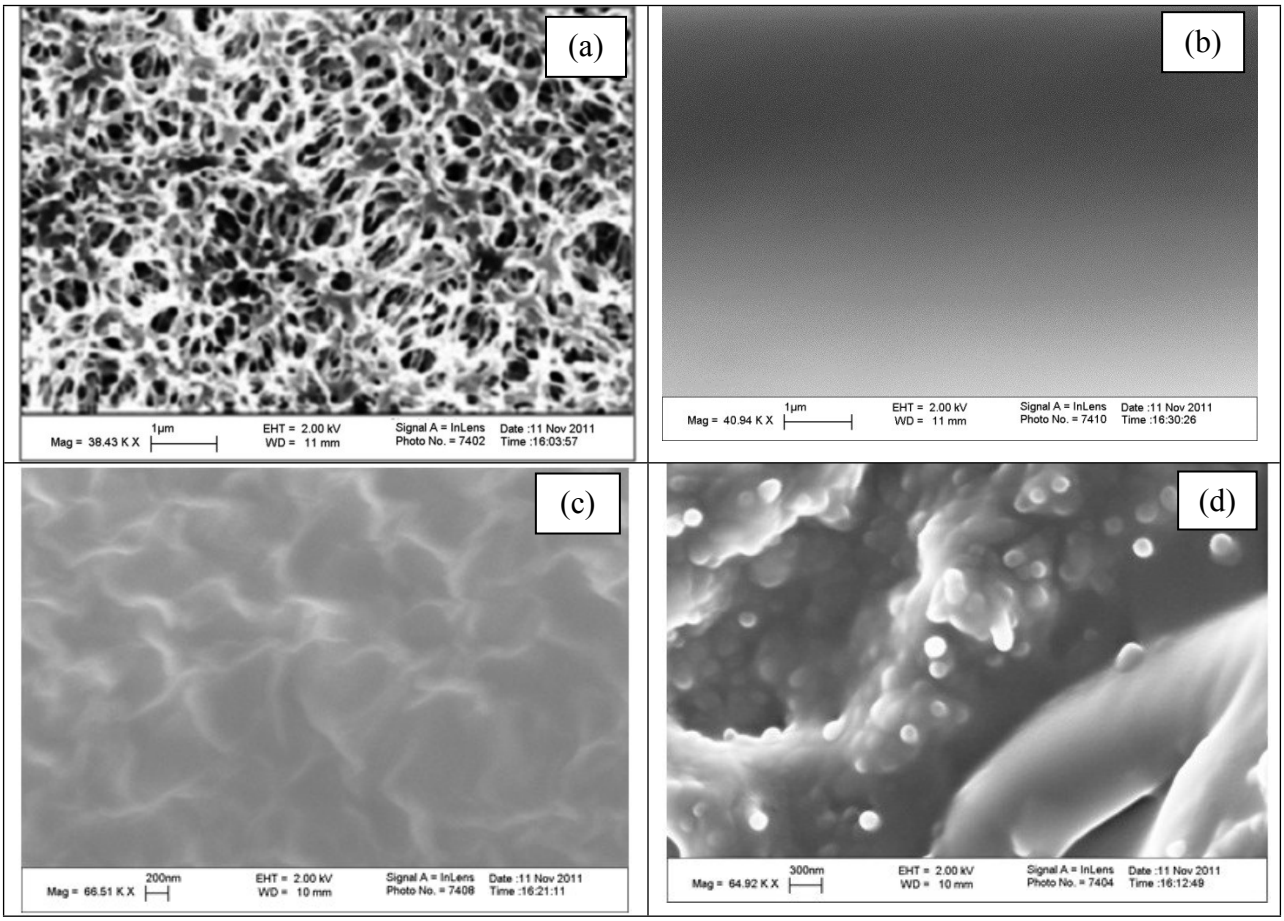
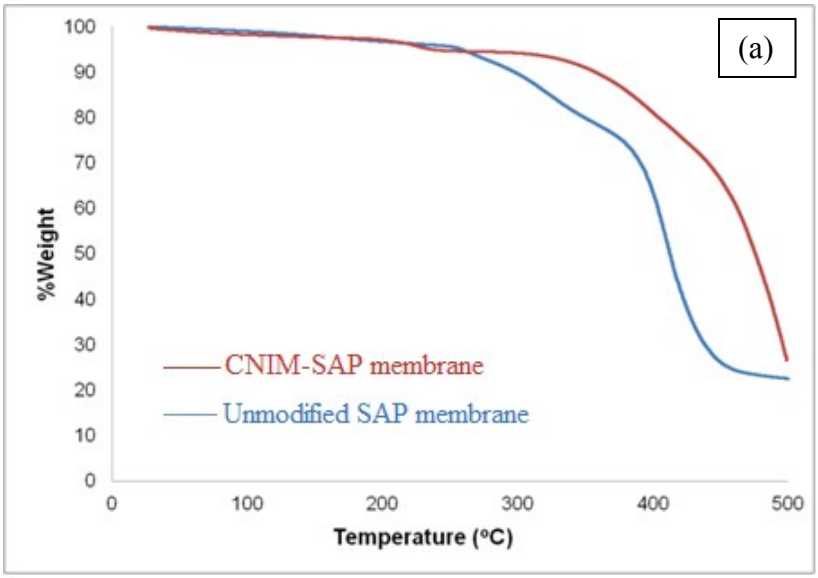


Fig. 1. SEM images of the surfaces of (a) plain PP substrate, (b) SAP, (c) CNIM-SAP, and the cross section of (d) CNIM-SAP.



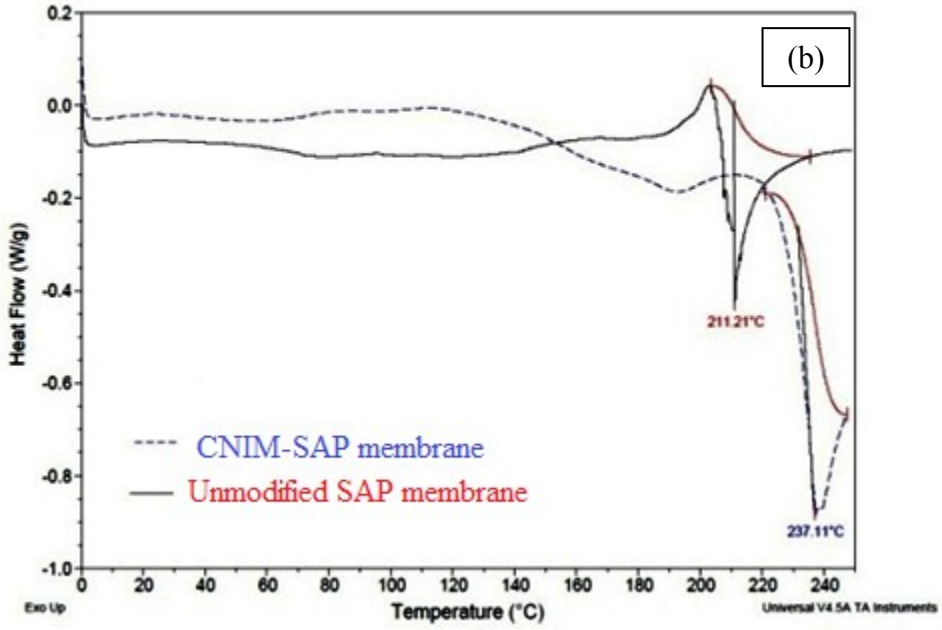


Fig. 2. a) TGA analysis of CNIM-SAP; b) DSC curves of the CNIM-SAP.