

3. The major vibration associated with the Nafion membrane (Fig. 3a) were found in N112, NS10W, NS20W nano-composite membranes. The two C-F stretching vibrations of the PTFE backbone can be observed at 1194 cm^{-1} and 1134 cm^{-1} . The peaks observed at 1054 cm^{-1} and 9670 cm^{-1} were attributed to the stretching vibration moieties of SO_3^- and C-O-C, respectively. IR spectra for bonding structure of C-O-C of Nafion membrane at wave number (967 cm^{-1}) shifts to lower wave number of 967 cm^{-1} for NS15W composite membranes. This phenomenon can be attributed to the strong interactions of SiO_2 component and sulfonate groups in side chain of the Nafion polymer [Ramani V. et al. 2004] [Shao Z.G. et al. 2004]

The observable peak at 980 cm^{-1} represents the vibration moiety of the W=O functional group. Therefore, it is evident from these data that the SiO_2 and PWA are indeed present in the composite membranes even after these membranes had undergone the pretreatment process of washing using 3wt % H_2O_2 and 0.5 M H_2SO_4 solution at the temperature of 80°C for 1 hour. It is apparent that the SiO_2 and PWA are compatible with Nafion membrane and the PWA is able to be immobilized into the SiO_2 media.

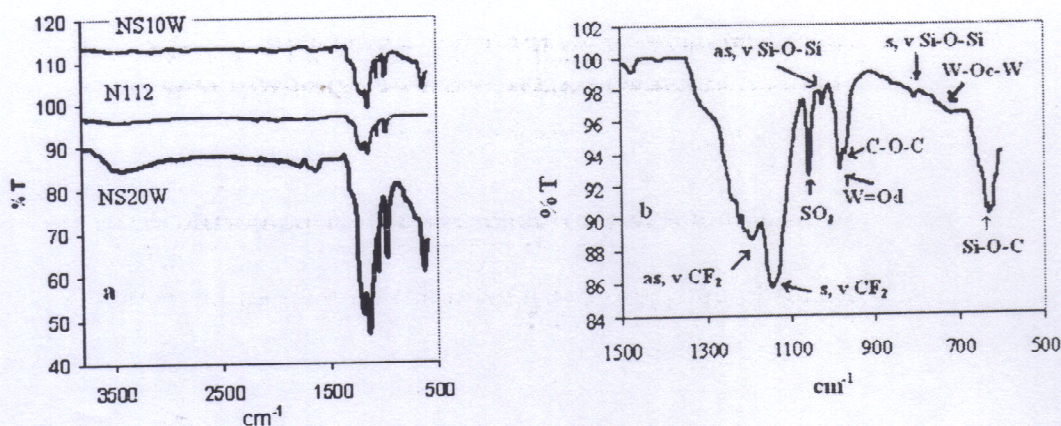


Figure 3

FTIR Spectra of (a) N112 Commercial Membrane, NS10W and NS20W Composite Membrane for NS15W is not shown (b) NS20W Composite Membrane