

## CONCLUSION

Nafion-SiO<sub>2</sub>-PWA composite membrane has been successfully made using sol-gel method at solvent evaporation temperature of 80°C and annealing temperature of 140°C for 10 hours at fixed ratio of PWA/SiO<sub>2</sub> = 0.4 (wt./wt.). All of the composite membrane synthesized at above conditions showed transparent visibility and suggested that the homogeneous distributions of the inorganic particles in the nano dimension of the organic matrix. The SEM and TEM measurements showed homogeneous structure of the composite and the particle size of less than 10 nm is obtained. The observable peak at 980 cm<sup>-1</sup> represents the vibration moiety of the W=O functional group. Therefore, it is evident that the SiO<sub>2</sub> and PWA are indeed present in the composite membranes even after these membranes had undergone the pretreatment process. It is apparent that the SiO<sub>2</sub> and PWA are compatible with Nafion membrane and the PWA is able to be immobilized into the SiO<sub>2</sub> media.

## REFERENCE

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