the polymer electrolyte membrane under low-temperature because of its excellent chemical, mechanical and thermal stability. However, the proton conductivity of the Nafion membrane depends strongly upon the water content in the membrane. Thus, development of proton-conducting membranes with high water-retention ability is crucial for elevated temperature PEMFCs and high power output [1].

Much work been conducted to modified the Nafion membrane with incorporated hygroscopic and high conductivity material such as Silicon oxide and heteropolyacid in the Nafion matrix [2], to increase water absorbstion of the membrane and conductivity. Many report have evident the Nafion-inorganic composite membrane more stable than pure Nafion membrane at low relative humidity condition [3, 4, 2, 5]. But in those reported papers, phenomenon behind the conductivity improvement not fully described in detail.

This research was conducted to investigate the role of inorganic component in the Nafion membrane to the electrochemical properties. To know the effect on addition of inorganic component to the electro-chemical property, the Nafion-SiO_2-PWA membrane was synthesized with varies the ratio of Nafion: SiO_2: PWA in the range of (1:0.0288:0.0154); (1:0.0432:0.0173) and (1:0.05768:0.023) respectively. Hopefully, incorporated inorganic compound like PWA that is hygroscopic and has high proton conductivity properties in the Nafion cluster strongly increase the amount of structural water in the film, improve the conductivity of the membrane and PEMFC performance especially at higher temperature and low relative humidity condition [5]

2. Experiment

2.1 Membrane preparation and membrane electrode assemblies

Material and method of the Nafion-SiO_2-PWA composite membrane and membrane electrode assemblies (MEA) have been reported in the previous paper [5] and a brief description described in Fig.1