

Effect of Wetting Characteristics on PEMFC Performance

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Introduction- The proton exchange membrane fuel cell (PEMFC) is one of the promising type of fuel cell as an alternative combustion engines because of low emission of environmental pollutants and high conversion efficiency. Typical proton conducting polymers for PEMFC are perfluorinated sulfonic acid polymers (e.g Dupont's Nafion). The wetting characteristics of Nafion can be modified chemically and thermally at elevated temperatures¹.

Experimental-In our present work, Nafion's hydrophilic-hydrophobic properties were controlled by heat-treatment in glycerol or in dried air in order to investigate the effect of wetting characteristics of Nafion on PEMFC performance.

Results- Fuel cell performances with a controlled amount of in the electrodes are presented in Figure.1 Increasing the hydrophilicity of Nafion in electrodes showed a lower performance in the mass transport region. A possible explanation is that with increased hydrophilicity, Nafion is capable of absorbing water until a flooding problem occurs in the electrode, which decreases the rate of oxygen diffusion to the active sites. On the contrary, a decrease in this characteristic enhances the PEMFC performance in the mass transport region. The results of the SAXS measurements and of some other physico-chemical properties and their correlation, with the PEMFC performances of the modified membrane and electrode assemblies.

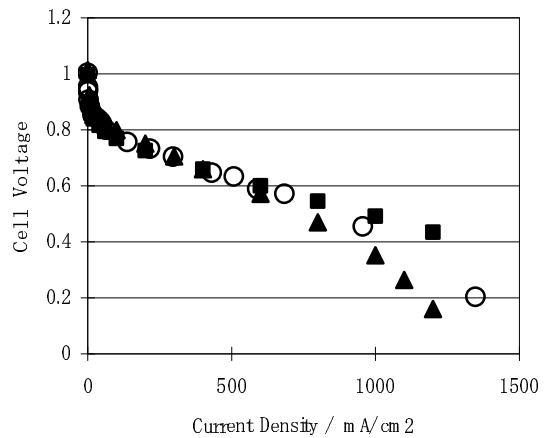


Figure. 1. Polarization curves at 80^o C, 1atm operation with H₂/O₂ system:
(○) Standard Nafion PEMFC
(■) More hydrophobic Nafion PEMFC
(▲) More hydrophilic Nafion PEMFC.

References:

1. K.Ishikiriya et.al., Journal of Colloid. Interface. Sci., 173, 419 (1995)
2. S.Tulyani et.al., Abstract No. 184, 201st Meeting of the Electrochemical Society at Philadelphia PA.

Acknowledgement

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