

## Comparison of Performance of Proton Exchange Membrane Fuel Cell Membrane Electrode Assemblies Prepared from 10 and 15-Micron Proton Exchange Membranes

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**Abstract :** Membrane electrode assemblies (MEAs) for proton exchange membrane fuel cell (PEMFC) applications were prepared by using 10 and 15  $\mu\text{m}$  PEMs. Except for different membrane thicknesses, these MEAs were prepared by the same conditions. They were prepared by using catalyst coated membrane (CCM) process. The catalyst employed is 40% Pt/C, and the Pt loading is  $0.5\text{mg}/\text{cm}^2$  for the sum of anode and cathode. Active area of the MEAs employed in this study is  $5\text{cm} \times 5\text{cm} = 25\text{cm}^2$ . In polarization measurements, the flow rates were always set at 1.2 stoic for anode and 3.0 stoic for cathode. The outlets were in open-end mode. The flow field is tri-serpentine design. The cell temperatures and the humidification conditions were varied for the purpose of MEA performance observations. It was found that the performance of these two types of MEAs is about the same at fully or partially humidified operation conditions; however, 10 $\mu\text{m}$  MEA exhibits higher current density in dry or low humidified conditions. For example, at 70C cell, 100% RH, and 0.6V condition, both MEAs have similar current density which is 1320 and 1342 $\text{mA}/\text{cm}^2$  for 15 $\mu\text{m}$  and 10 $\mu\text{m}$  product, respectively. However, when in operation without external humidification, 10 $\mu\text{m}$  MEA can produce 1085 $\text{mA}/\text{cm}^2$ ; whereas 15 $\mu\text{m}$  MEA produces only 720 $\text{mA}/\text{cm}^2$ .

**Keywords :** fuel cell, membrane electrode assembly, PEFC, PEMFC, proton exchange membrane

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