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Abstract
This study used one or two types of catalysts, with different Pt weight percentages, to form the catalyst layer on the anode of Direct Methanol Fuel Cell (DMFC). In order to reduce the cost of fuel cell, the comparisons with the performance of MEA (Membrane Electrode Assembly) at low Pt loading (0.7mg/cm2) were conducted. The Experimental results showed the MEA with best performance was using Pt-Ru/C 60%:0.35mg Pt/cm2 and Pt-Ru/C 20%:0.35mg Pt/cm2. The activation of catalyst was evaluated by Cyclic Voltammetry method. The result showed that the activation of bi-catalyst is apparently higher than a single catalyst at the same Pt loading. According to the performance of single cell test, the maximum current density can be achieved with 356 mA/cm2 @ 0.15V, and the maximum power density can be achieved with 65 mW/cm2 @ 0.25V.
A stack that consisted of three single cells was made in this study, the decision of choosing the fluid channel type was made after practical tests. Barrier type fluid channel will cause uneven distribution of reactants and consequentially reduce the utilization of catalyst. Three-serpentine channel forced the flow of feeding reactants, which not only distributed the reactant uniformly, but also discharged CO2 and water out of the stack, while, the flooding problem was avoided when fuel cells ran on higher current density.
This study also investigated the problems of stack assembling and design and finally provided solutions. The best design parameters of single cell were applied to built a home-made stack, and the performance was compared with the single cell. The maximum current density with 160 mA/cm2 was reached from the stack tests, which was only 45% compared with a single cell, and the highest power density was 82.4 mW/cm2 @ 0.64V.
Key Words:
DMFC Stack、Mix-Catalyst、Proton Exchange Membrane、MEA.
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