

Synthesis alternative PEMFC cathode catalyst with titanium dioxide support materials

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Highly active modified Pt/TiO₂ catalyst was synthesized by following steps. The titanium dioxide nanofiber (TiO₂) as a support material prepared by electrospinning, platinum (Pt) nanoparticles deposited on TiO₂ nanofiber by Microwave-assisted polyol method. The platinum particles is about 5nm and TiO₂ nanofiber diameter was about 300nm. Although it is hard to direct use Pt/TiO₂ catalyst for PEMFC cathode, by adding a carbon nanotube (CNT) improves activity of the Pt/TiO₂ catalyst. The CNT added Pt/TiO₂ (CNT-Pt/TiO₂) catalyst sample was characterized by XRD, SEM, TEM, and electrochemical measurements. The results show that the CNT-Pt/TiO₂ catalyst has significantly enhanced performance to comparable with commercial Pt/C catalyst. Also it has much more durable than carbon support. CNT is well mixed with TiO₂ nanofiber and makes 3D web structure. Electrons created on platinum can transfer on the CNT. CNT-Pt/TiO₂ has enhanced electrical conductivity. From the single cell test, the resistance of catalyst decreases about 6 times and current density increases about 8 times of initial Pt/TiO₂. CNT-Pt/TiO₂ achieved 0.189 Ω and 1322mA/cm² at 0.6V (0.76W/cm²).