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Effect of calcination temperature of Pt-hollow structured-TiO₂ on electrochemical properties in self-humidifying PEMFC with dual catalyst electrode

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A hollow shell TiO₂ (HTiO₂) with a high surface area was synthesized via the monodispersed SiO₂ nanoparticles as the template onto which Pt nanoparticles were deposited. The self-humidifying dual catalyst electrode (DCE) comprising Pt/C and Pt-HTiO₂ was applied to the MEA. Pt/C acts as the catalyst for oxygen reduction reaction while Pt-HTiO₂ provides the sites for the creation of water (Pt sites) and the water retention by hydrophilic hollow structured HTiO₂. This unique dual catalyst electrode is expected to humidify the membrane, making the operation of the PEMFC in the absence of water (i.e., zero relative humidity). The physical properties of HTiO₂ obtained under different calcination temperatures were investigated that is, specific surface area by Brunauer-Emmet-Teller method (BET), pore size distribution by Barrett-Joyner-Halenda (BJH) method and water uptake. Contact angle was conducted to Pt-HTiO₂ catalyst layer to identify the hydrophilicity of various Pt-HTiO₂. In addition, several electrochemical properties were also investigated and the cell performance for the membrane electrode assembly fabricated with prepared dual catalyst electrodes were conducted and discussed.

Biography

Wha Jung Kim is working in the Department of Materials Chemistry and Engineering, Konkuk University. His research has been focused on zeolite synthesis and its application such as CO₂ adsorption, heavy metal removal through ion exchange, catalytic reaction, development of electrochemical catalysts and their application to PEMFC. His expertise is especially towards the development of self-humidifying catalyst and membrane.

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