

Nanomaterial applications in fuel cell

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ABSTRACT

Nanomaterials have important roles in fuel cell with many reasons. Nanomaterials can induce increasing the surface area of the anode and cathode catalyst, increasing the catalytic rate of oxidation or reduction. The cost reduction of materials for membrane and catalysts is also important. The use and design of nanophase material in fuel cell is critical for the commercialization of fuel cell system.

Sulfonic-functionalized heteropolyacid-SiO₂ nanoparticles were synthesized and applied to the modified Nafion® membrane for DMFC. The DMFC performance of the composite membrane increased the operating temperature from 80 to 200 °C. The function of the sulfonic-functionalized heteropolyacid-SiO₂ nanoparticles was to provide a proton carrier and act as a water reservoir in the composite membrane at elevated temperature. We report several cases of nanomaterial application to fuel cell.

Carbon nanofiber/activated carbon fiber (CNF/ACF) composite with multifunctional surfaces were prepared through catalytic growth of CNFs on an ACF. The unit cell performance of PEMFC showed better activity on (PtCNF/ACF + Pt/C) electrode. CNF/ACF are expected to be promising support to improve the performance in PEMFC.

A combinatorial study has been accomplished to clarify the optimized novel nano-size metal alloy composition for accelerating hydrogen generation of NaBH₄. In this test, Ru-Co-Fe alloy shows good trimetallic effect. To form highly dispersed metal alloy catalyst, ACF was chosen as a substrate.

Reference

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