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Novel Sol-Gel Approaches to Nanocrystalline Noble Metal Catalyst Powders and Nanotube Structures for Direct Methanol Fuel Cells

Prashant N. Kumta

Professor, Department of Materials Science and Engineering, Carnegie Mellon University, Pittsburgh, PA

Shi-Chune Yao

Professor, Department of Mechanical Engineering, Carnegie Mellon University, Pittsburgh, PA

Jeffrey Maranchi

Graduate Student, Department of Materials Science and Engineering, Carnegie Mellon University, Pittsburgh, PA

Industry Participants

DuPont de Nemours, Towanda, PA

Abstract

A novel sol-gel process has been developed utilizing non-halide precursors. The metal carboxylate precursors will be hydrolyzed and complexed using suitable chelating agents to generate a molecularly coordinated complex gel. The gel precursor will be subjected to careful heat treatment in an inert atmosphere substituted with oxygen to eliminate carbon without inducing oxidation of the precursor. Thermal treatments of the as-prepared precursor results in the generation of single phase Pt-Ru catalyst. The resultant catalyst exhibits a surface area of 140 m²/g.

The novel sol-gel derived catalysts will be characterized for structure, phase and composition using X-ray diffraction, thermal analysis and high resolution transmission electron microscopy. Electrochemical characterization of the catalysts will also be conducted using a 3-electrode half cell assembly. The surface area of the synthesized catalysts will be measured, while suitable samples will be sent to DuPont for conducting systematic electrochemical tests in full fuel cell configurations.