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Optimal Compositional Design of Nanostructured Electrocatalysts for Direct Methanol Fuel Cells

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Abstract

A novel sol-gel process has therefore been developed utilizing non-halide precursors. The metal carboxylate precursors will be hydrolyzed and complexed using suitable chelating agents to generate a molecularly coordinated complexed gel containing varying amounts of osmium and iridium to identify compositions that will yield the most optimum electrocatalytic activity exceeding that of JM. The gel precursors will be subjected to careful heat treatment in an inert atmosphere substituted with oxygen to eliminate carbon without inducing oxidation of the precursor. Thermal treatment of the as-prepared precursors in various atmospheres will result in the generation of single phase solid solutions of Pt-Ru alloys containing Os and Ir. The resultant catalysts will likely exhibit surface areas in the 120-160 m^2/g range.

These 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.