Development, Characterization, and Evaluation of Transition Metal/Chalcogen Based Cathode Catalysts for PEM Fuel Cells (New FY 2004 Project)

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Objectives

Develop a non-precious metal cathode catalyst for proton exchange membrane (PEM) fuel cells which is as active and as durable as current platinum group metal (PGM) based catalysts at a significantly reduced cost.

Technical Barriers

This project addresses the following technical barrier from the Fuel Cells section of the Hydrogen, Fuel Cells and Infrastructure Technologies Program Multi-Year R,D&D Plan:

- O. Stack Material and Manufacturing Cost

Approach

The objective of this project is to develop a non-precious metal cathode catalyst for PEM fuel cells which is as active and as durable as current PGM based catalysts at a significantly reduced cost. The catalytic surfaces of interest are based upon non-precious transition metals such as Co, Ni, Cr and Fe in structures with non-stoichiometric amounts of chalcogens (S and Se) to produce the active sites in an oxygen containing environment.

The partnership Ballard Power Systems has with several universities, including the University of British Columbia and Case Western Reserve University, links together for the first time fundamental research on electrocatalysis and evaluation of catalysts in real fuel cell stacks. This project brings together scientific knowledge and innovation with commercial considerations and technological verification, giving an opportunity to deliver an application-ready material.

This work will study well defined surfaces to determine not only the magnitude of the activity but also the nature of the active site and the mechanism involved. The project will then proceed to develop a commercially viable, environmentally friendly process for the production of high surface area fuel cell catalysts for demonstration in fuel cell stacks.

The major advantages of this project are not just cost related, as the development of catalysts that are more specific for oxygen reduction than platinum leads to catalysts that are more robust and less sensitive to air-borne contaminants. The lower cost of a major component of fuel cell technology will significantly advance the fuel cell technology towards the marketplace in commercial products such as vehicles and portable power applications.