

Connecticut Global Fuel Cell Center (CGFCC) Seminar Announcement

Seminar Topic: Review of High Temperature Fuel Cell Technologies and Applications
Presented by: Dr. Hossein Ghezeli-Ayagh, FuelCell Energy, Inc., Danbury, CT

Date: February 5, 2009
Time: 10:00 -11:00 AM
Location: CGFCC Conference Room

Abstract: In recent years, there has been a steady and significant progress in the development of fuel cells for power generation. The motivation has been the ever-increasing demand for electricity, the rising cost of fossil fuel, and the environmental concerns about pollution and greenhouse effects. Fuel cell principle of operation is based on electrochemical reaction of the hydrogen with oxygen derived from air. Since fuel cells are not limited by the Carnot cycle thermodynamic efficiency, they have the potential to produce power very efficiently as compared to heat engines and combustion turbines.

Early on, fuel cells were initially developed for the space applications. In the late 1950s, the National Aeronautics and Space Administration (NASA) began to search for a compact electricity generator to provide onboard power for an upcoming series of manned space missions. After discarding nuclear reactors as too risky, batteries as too heavy and short-lived, and solar power as too cumbersome, NASA turned to fuel cells. Today, after reliably supplying electricity (and water) to the Apollo and Space Shuttle missions, fuel cells have proven their role in space. In the near future, fuel cells have the potential to significantly impact generation and distribution of electricity. Recently, a hybrid fuel cell/turbine power plant (~250kW) achieved a near record-breaking efficiency of 56% in a demonstration project in Montana. This power plant includes an internally reforming MCFC. Fuel cells are also poised as power generation sources for the transportation applications including electric vehicles and navy vessels.

In this presentation, examples of how fuel cells are utilized in a system to achieve power production will be discussed. Also, an outline of some of the unique considerations in design of a fuel cell power plant will be presented. Advanced applications of the fuel cell systems including the state-of-the-art of the technology will be presented. The presentation will focus on high temperature fuel cells including SOFC and MCFC.

About the Author: Hossein Ghezeli-Ayagh is the Director of SECA Program at FuelCell Energy (FCE), Danbury, CT. He has a PhD in Chemical Engineering from Illinois Institute of Technology. He joined FCE in 1983 where he has been involved in research activities related to energy and electrochemical based power sources. He has contributed to the development of fuel cell technologies and systems including nano-scale electrocatalyst, cell stack, fuel processing, and small to multi-MW-scale power plant designs. He has participated in development of various types of fuel cells including: phosphoric acid fuel cell (PFAC), polymer electrolyte membrane fuel cell (PEMFC), molten carbonate fuel cell (MCFC), and solid oxide fuel cell (SOFC). He has also been engaged in evaluation, testing and design of systems using both liquid (petroleum distillates) and gaseous (natural gas, syngas) fuels. He currently manages the development of ultra efficient fuel cell systems under a Department of Energy's Vision 21 program. He is also responsible for the development of hybrid SOFC systems for undersea propulsion and large-scale coal-based IGFC (integrated gasification fuel cell) applications. He has authored a chapter in the Handbook of Fuel Cells and numerous other publications and patents related to fuel cells.

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