

Date: Thursday, January 10, 2008

Time: 11:00 am – 12:00 pm

Room: SL 165

Everyone is invited

Advanced Battery and Fuel Cell Development for EV/HEV: From Materials to System

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Abstract.

Safety is the major challenge for Lithium ion battery (LIB) used in EV/HEV. Flammable organic solvents in LIB easily cause fire and explosion when LIB is overcharged/discharged. Use of non flammable room temperature ionic liquids as LIB electrolyte can eliminate this safety issue. The exploratory work on use of ionic liquids as LIB electrolyte will be presented. The preliminary results on developing new battery system using ionic liquid as electrolyte, Li or Na as anode and V_2O_5 xerogel as cathode will be discussed.

The capacity of each battery module in a battery pack is slightly different. The difference widens as battery pack is cycled and the capacity and life of the pack is limited by the weakest module. A Distributed Battery Management System (DBMS) can effectively manage each battery module and minimize the difference by dynamically balancing modules during the cycles. The development of a DBMS and the performance a 19KW "Mini-Pack" managed by the DBMS will be presented.

Platinum nano particle supported by carbon (i.e. Pt/C) is the major catalyst for polymer electrolyte fuel cells (PEFC). The successful commercialization of fuel cells not only requires the catalyst to have high performance but also high stability (durability). The kinetic performance of the Pt/C catalyst depends on Pt nano-particle dispersion on a carbon surface. Conventional carbon surfaces are not homogeneous in terms of surface energy and chemical composition. This results in an inhomogeneous dispersion of Pt nano particles. A new approach was taken to improve Pt nano particle dispersion over carbon as well as catalyst stability by modified carbon surface. The development of a new catalyst and MEA with high performance using modified carbons will be discussed. The characterization (using XRD, BET, TEM, SEM, XPS, and Hg porosimetry) and the performance of these catalysts and MEAs under different relative humidity will be presented as well as its durability/stability.

About the Speaker.

Dr. Xie recently joined the Department of Mechanical Engineering as an Assistant Professor. Prior to working at IUPUI, he worked as a principle research scientist at Battelle Memorial Institute, working on fuel cell R&D as well as Li-ion batteries and artificial lung. Prior to Battelle, as the program manager and senior electrochemical engineer at Cabot Corp, Dr. Xie worked extensively on catalyst development for fuel cells. Dr. Xie spent four years at Los Alamos National Laboratory on fuel cell research covering from membrane electrolytes, catalysts, membrane electrode assembly (MEA) to durability of fuel cells. As a system engineer, Dr. Xie was in charge of developing electric propulsion system for Electric Vehicle (EV) and Hybrid EV at General Motors Advanced Technology Vehicle, Indianapolis Technical Center. Dr. Xie received his PhD from Miami University, and BS on chemical engineering (emphasis on electrochemical engineering) from Tianjin University.