PIMS / AMI Seminar

Friday, September 30, 2011
3:00 p.m.
CAB 657

"Modeling Studies and Efficient Numerical Methods for Proton Exchange Membrane Fuel Cell"

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Abstract

In this talk, a three-dimensional, non-isothermal, multiphase, two phase steady state transport model and its efficient numerical methods are systematically studied for a full proton exchange membrane fuel cell (PEMFC), in the sense of efficiency and accuracy. The conservation equations of mass, momentum, species, charge and energy are fully addressed in view of the non-isothermality and multiphase feature in PEMFC model. In addition, we present some new formulations for species equations in the interests of interactions among the species from an accurate numerical discretization's point of view. In a framework of the combined finite element-upwind finite volume method, some efficient numerical methods are developed in terms of Kirchhoff transformation in order to achieve fast and convergent numerical simulation for the studied PEMFC model. Three-dimensional numerical simulations demonstrate that the convergent physical solutions can be attained within 80 steps, in contrast to the oscillating and non-convergent nonlinear iterations conducted by commercial flow solvers or in-house code with standard finite element/volume methods. The results of numerical convergence tests verify the efficiency and accuracy of our numerical algorithms and techniques.

Refreshments will be served in CAB 649 at 2:30 p.m.