（6 月 17 日）教育部“节能与环保汽车创新引智基地”报告系列

时间：2011 年 6 月 17 日（周五）14:30-16:30

地点：新能源汽车工程中心 319 会议室

报告人：孙澎涛博士

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主持人：周苏 教授

报告题目：Efficient numerical methods for a two-phase transport model of polymer electrolyte fuel cell containing micro-porous layer

报告摘要：In this talk, an efficient numerical method for a three-dimensional, two-phase transport model is presented for polymer electrolyte fuel cell (PEFC) including multi-layer diffusion media, composed of two or more layers of porous materials having different pore sizes and/or wetting characteristics. Particularly, capillary pressure is continuous, whereas liquid saturation is discontinuous, across the interface of gas diffusion layer (GDL) and micro-porous layer (MPL), which can improve liquid-water transport in the porous electrode. We design a nonlinear Dirichlet/Robin iteration-by-subdomain domain decomposition method to deal with water transport in such multi-layer diffusion media, where Kirchhoff transformation and its inverse techniques are employed to conquer the discontinuous water diffusivity in the coexisting single- and two-phase regions. In addition, the conservation equations of mass, momentum, charge, hydrogen and oxygen transport are numerically solved by finite element-upwind finite volume method. Numerical simulations demonstrate that the presented techniques are effective to obtain a fast and convergent nonlinear iteration for a 3D full PEFC model within around a hundred steps. A series of numerical convergence tests are carried out to verify the efficiency and accuracy of our numerical algorithms and techniques.

新能源汽车工程中心

2011 年 6 月 13 日

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