1. Modeling and Simulation of Energy Extraction Processes in Fuel Cells

Fuel cell is one of the promising renewable energy technologies that generates electricity by a chemical reaction. Most importantly, fuel cells generate electricity with very little pollution, and emits a harmless byproduct, water. Unlike batteries, fuel cells produce electricity as long as fuel (hydrogen) is supplied. Nevertheless, fuel cell is often compared to batteries as it is used as primary and backup power source.

Computational models are cost effective way to understand and optimize the electrochemical energy extraction processes in fuel cells. The model consists of coupled nonlinear partial differential equations (PDEs), and the solution of these PDEs are very challenging. The aim of the project is to develop an accurate and efficient numerical (finite element) scheme for simulation of electrochemical processes. This project also involves parallel implementation of the developed numerical scheme in our in-house finite element package ParMooN.

Research Areas: *Electrochemical Processes; Computational Mathematics; Modeling and Simulation; Finite Element Methods; Parallel Algorithms*

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