PhD Position on Mathematical Modeling of Polymer Electrolyte Fuel Cells

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Carlos III University of Madrid (UC3M) is a relatively small, innovative, public university, providing teaching of the highest quality and focused primarily on research. The mission of UC3M is to contribute to the improvement of society through teaching of the highest quality and cutting-edge research in line with stringent international guidelines. UC3M is included in the QS Top 50 Under 50, a ranking of the world's top 50 universities established within the last 50 years.

Background and motivation:

The Fluid Mechanics Research Group of the Department of Thermal and Fluids Engineering at UC3M carries out research on a wide variety of topics in fluid mechanics and combustion, encompassing theoretical, numerical and experimental studies. Among them, one emerging research line is focused on the fundamental understanding and design of next-generation, high-performance, durable fuel cells, along with the physical characterization of their main components. The work in the group combines advanced multiphysics, multiphase and multiscale modeling techniques with sophisticated experimental diagnostic and visualization tools.

The group is looking for a self-motivated PhD student with background in fluid mechanics and electrochemistry. The work will involve the modeling and experimental analysis of the complex and coupled mass, charge and heat transport phenomena and electrochemical kinetics that take place in the small scales of hydrogen Polymer Electrolyte Fuel Cells (PEFCs).

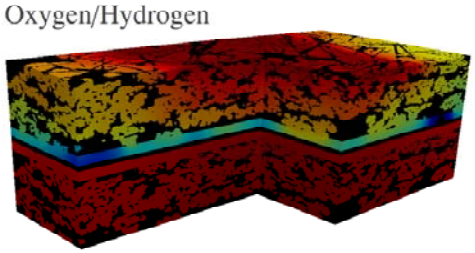

Figure: DNS of oxygen (up) and hydrogen (down) concentration distributions in the Membrane Electrode Assembly (MEA).

Project partners: The team actively collaborates with several research and academic institutions around the world, including University of Waterloo, Wichita State University, Lawrence Berkeley National Lab (LBNL), Tufts University and German Aerospace Center (DLR).

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Conditions: Doctoral studies extend over a 4-year period during which the PhD student will receive a salary as an employee of the department. Doctoral students are expected to engage in full-time study and research, and to participate actively in the department's activities. The candidate should have finished his/her Master's studies by January 2018. See here for more information.

Funding: Carlos III University of Madrid will open a call for PhD candidates in a couple of months. The student will start his/her work around February 2018.

Placement: Department of Thermal and Fluids Engineering at Carlos III University of Madrid.

Type of employment: Full time, 4 years.

Number of positions for this Project: 1

Town/Province/Country: Leganés/Madrid/Spain https://goo.gl/maps/rJgWpMmTMyx

References:

[1] P. A. García-Salaberri, D. G. Sánchez, P. Boillat, M. Vera, K. A. Friedrich, Hydration and dehydration cycles in polymer electrolyte fuel cells operated with wet anode and dry cathode feed: A neutron imaging and modeling study, J. Power Sources 359 (2017) 634–655.

[2] P. A. García-Salaberri, M. Vera, On the effect of operating conditions in liquid-feed DMFCs: A multiphysics modeling approach, Energy 113 (2016) 1265–1287.

[3] P. A. García-Salaberri, J. T. Gostick, G. Hwang, A. Z. Weber, M. Vera, Effective diffusivity in partially-saturated carbon-fiber gas diffusion layers: Effect of local saturation and application to macroscopic continuum models, J. Power Sources 296 (2015) 440–453.

[4] P. A. García-Salaberri, G. Hwang, M. Vera, A. Z. Weber, J. T. Gostick, Effective diffusivity in partially-saturated carbon-fiber gas diffusion layers: Effect of through-plane saturation distribution, Int. J. Heat Mass Transf. 86 (2015) 319–333.

[5] P. A. García-Salaberri, M. Vera, R. Zaera, Nonlinear orthotropic model of the inhomogeneous assembly compression of PEM fuel cell gas diffusion layers, Int. J. Hydrogen Energy 36 (2011) 11856–11870.

Fluid Mechanics