Internship offer

Title: Microfluidic testing based on Distribution of Relaxation Times

Location of the internship: Arts et Métiers Bordeaux, Esplanade des Arts et Métiers 33405 Talence Cédex, FRANCE

Laboratory: TFIC group at the Mechanical Engineering Institute of Bordeaux (I2M, https://www.i2m.u-bordeaux.fr/)

Supervisor: Prof. **Chevalier Stéphane**, Tél.: +33 5 56 84 54 08, email: stephane.chevalier@ensam.eu

Description :
In the framework of a research project aiming to develop green energy production technologies, the research group at Arts et Métiers in Bordeaux develop new microfluidic fuel cells. These Microfluidic fuel cells (MFC) are particular microfluidic devices used to convert the chemical energy contained in fuels directly into electricity [1]. Such devices are composed of a microfluidic channel which ensures a rather good control of the hydrodynamic conditions. Two electrodes are also embedded where the electrochemical reaction takes place: an oxidation at the anode and a reduction at the cathode. Such kind of MFC can be used both in galvanostatic or electrolysis mode which makes this technology a promising candidate for energy conversion and storage. There exists a wide variety of MFCs in the literature, and more details about them can be found in the following comprehensive review [2].

The goal of the internship is to test a new experimental method called Distribution of Relaxation Times (DRT) to evaluate the performance of the MFC. The student will used lab made fuel cells and test them experimentally. Applying the DRT methodology, he/she will be able to evaluate the different energy losses and to propose few optimizations from the point of view of the fabrication and operation to improve the performances of these technologies.

This internship will be supervised by Prof. Stéphane Chevalier and a PhD student, Kevin Krause, who did his master thesis at UofT. Kevin Krause is a native English speaker involved in the research project on MFC.

Duration of the internship: 2 to 3 months from May to July 2022

Profile of the candidate:
The candidate needs to have a strong knowledge in mechanical engineering and a strong taste in experimental work. A good knowledge in signal processing (i.e. Fourier transform) is also advised for a better understanding of the DRT method. In addition, a background in microfluidic applications (chemistry or energy) would be appreciated. The candidate must have very good communication skills to weekly report his/her work and to integrate a young research team made of 10 PhD and Master students. It is also important to be able to work with autonomy.

References :
[1] E.R. Choban, L.J. Markoski, A. Wieckowski, P.J.A. Kenis, Microfluidic fuel cell based on laminar flow, J. Power Sources. 128 (2004) 54–60.
[2] E. Kjeang, N. Djilali, D. Sinton, Microfluidic fuel cells: A review, J. Power Sources. 186 (2009) 353–369.