

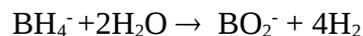
Post-doctoral fellow: local characterization of a direct borohydride fuel cell

Direct borohydride fuel cells (DBFC) are a promising alternative to PEMFCs for mobile applications. They benefit from the advantages of the NaBH₄ fuel (NaBH₄ is easy to store and transport as a dry material, is dense in energy and can easily be fed as a stable fuel in alkaline anolyte solutions), but also from the fact it can use non-noble catalysts (cheaper and more abundant than platinum, the classical catalyst in low-temperature fuel cells). However, the anodic reaction in a DBFC (the borohydride oxidation reaction: BOR) is complex and still insufficiently mastered. In particular, the knowledge derived from lab-scale experiments (in model conditions, dilute anolyte solutions, low temperature) is insufficient to predict the behavior of DBFC systems.

Depending on materials and working conditions (especially temperature), different reactions can occur. Borohydride may be directly oxidized to borate:



Or may be decomposed catalytically to hydrogen:



Even if hydrogen can be recovered and oxidized ($\text{H}_2 + 2\text{OH}^- \rightarrow 2\text{H}_2\text{O} + 2\text{e}^-$), the direct reaction is preferable because it leads to a higher cell potential. A consequence of the competition between these two reactions is a working heterogeneity between the fuel inlet and outlet, the hydrogen ratio increasing down the channel direction. The objective of this project is to characterize locally - between the fuel inlet and outlet- the functioning of a DBFC using a segmented cell. This tool allows measuring the current density and local potentials thanks to reference electrodes put on the edge of the active area [1,2].

The desired profile is ideally that of an experimenter with good bases in modelling of the transfer phenomena and electrochemistry. This work is a part of the ANR “Mobidic” Project. (<http://www.agence-nationale-recherche.fr/?Projet=ANR-16-CE05-0009>)

Nancy, France, University of Lorraine

The salary range for this position is: € 2,000-2300 per month

12 months contract to start in January 2017

Gaël Maranzana

Fuel Cell Team

[LEMTA](http://www.lemta.fr) - UMR 7563 [CNRS](http://www.cnrs.fr) – [Université de Lorraine](http://www.univ-lorraine.fr)

54518 Vandoeuvre cedex, FRANCE

Tél. direct : 33/0 3 83 59 55 48

Gael.maranzana@univ-nancy.fr

<http://www.lemta.fr/>

[1] Durst J., Lamibrac A., Charlot F., Dillet J.T, Castanheira L.F. , Maranzana G., Dubau L., Maillard F., Chatenet M., Lottin O., *Applied Catalysis B: Environmental*, Volumes 138-139, 17, 2013

[2] Abbou, S., Dillet, J., Maranzana, G., Didierjean, S., Lottin, O., Local potential evolutions during proton exchange membrane fuel cell operation with dead-ended anode – Part I: Impact of water diffusion and nitrogen crossover, *Journal of Power Sources*, 2017.