

Electrocatalysis of oxygen reduction reaction for proton exchange membrane fuel cell application

L. Dubau^{a,b}, T. Asset^{a,b}, R. Chattot^{a,b}, M. Chatenet^{a,b}, F. Maillard^{a,b}

^a Univ. Grenoble Alpes, LEPMI, F-38000 Grenoble, France

^b CNRS, LEPMI, F-38000 Grenoble, France

E-mail: laetitia.dubau@lepmi.grenoble-inp.fr

The ever-growing energy demand worldwide and the announced end of the so-called “fossil fuel era” are currently boosting the development of electrochemical energy technologies, such as fuel cells, batteries and supercapacitors. In proton-exchange membrane fuel cells (PEMFC), special effort has been paid to improve the catalytic activity for the oxygen reduction reaction (ORR) of the cathodic material, its stability and to decrease its precious metal content. Pt/C or bimetallic Pt₃M/C electrocatalysts (with M = Cr, Fe, Co, Ni, Cu) are now classically used at the cathode because of their enhanced oxygen reduction reaction (ORR) activity (Figure 1). However, an increased ORR activity is meaningless if it cannot be maintained over time.

This presentation will describe the stability issues encountered by Pt₃M/C cathode materials in model and real operating conditions¹. From this results, mitigation strategies in terms of design of architected nanoparticles will be addressed^{2,3}.

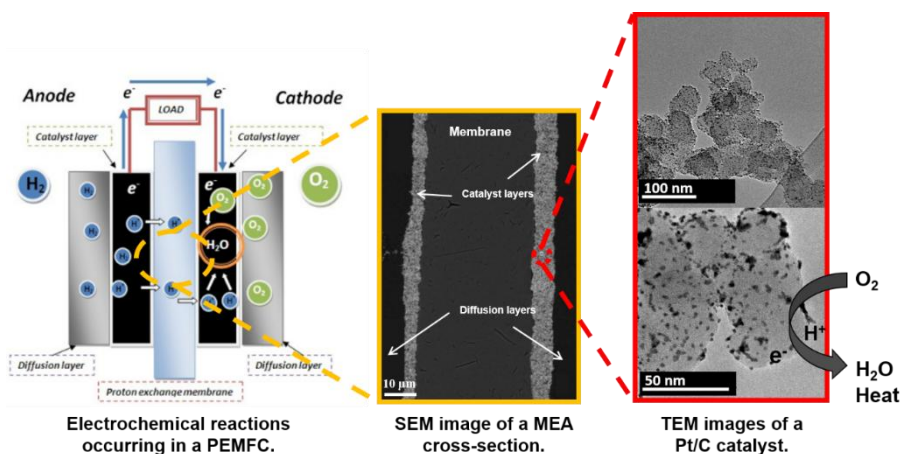


Figure 1. Components of a single PEM fuel cell: schematic (left); scanning electron microscopy (SEM) image of the MEA (middle) and transmission electron microscopy (TEM) images of a commercial Pt/C catalyst

- (1) L. Dubau, L. Castanheira, F. Maillard, M. Chatenet, O. Lottin, G. Maranzana, J. Dillet, A. Lamibrac, J.-C. Perrin, E. Moukheiber, A. Elkaddouri, G. De Moor, C. Bas, L. Flandin, N. Caqué, *Wiley Interdisciplinary Reviews: Energy and Environment*, **2014**, *3*, 540.
- (2) T. Asset, M. Fontana, B. Mercier-Guyon, R. Chattot, N. Job, L. Dubau, F. Maillard, *ChemPhysChem.*, **2018**, *19*, 1552.
- (3) R. Chattot, O. Le Bacq, V. Beermann, S. Kühn, J. Herranz, S. Henning, L. Kühn, T. Asset, L. Guétaz, G. Renou, J. Drnec, P. Bordet, A. Pasturel, A. Eychmüller, T. J. Schmidt, P. Strasser, L. Dubau, F. Maillard, *Nat. Mater.*, **2018**, *17*, 827.