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Innovative Corrosion Resistant Catalysts and Supports For Proton-Exchange Membrane Fuel Cell Cathodes

G. Cognard, [a,b] G. Ozouf, [c] C. Beauger, [c] L. Dubau, [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
[c] MINES ParisTech, PSL Research University PERSEE - Centre procédés, énergies renouvelables et systèmes énergétiques, CS 10207 rue Claude Daunesse, F-06904 Sophia Antipolis Cedex, France

frederic.maillard@lepmi.grenoble-inp.fr

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The ever-increasing energy consumption from developed and developing countries endangers our future supply of energy and releases greenhouse gases in the atmosphere. As a response, more efficient and diversified power generation systems are required, in particular based on renewables. In this context, electrochemical storage and conversion systems such as electrolysers and fuel cells will be major actors. They can store electrical energy into chemical energy via water electrolysis (for example into the H-H bond of the H_2 molecule), and convert back this chemical energy into electrical energy via fuel cells when needed [1]. A major challenge in these systems is however to find highly active and stable materials, to sustainably catalyse the electrochemical reactions [1].

This contribution first shortly presents the degradation mechanisms of proton-exchange membrane fuel cell materials in model and real PEMFC operating conditions. Then, innovative strategies towards more active and more stable electrocatalysts will be emphasized, in particular using alternative supports (graphitic carbon and metal-oxides)[2, 3] and catalysts (hollow Pt-based nanoparticles)[4, 5] investigated at LEPMI.

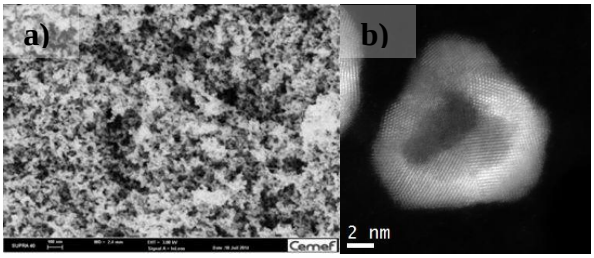

Figure 1: (a) Scanning electron microscopy image of antimony-doped tin dioxide aerogel and (b) transmission electron microscopy image of hollow PtNi/C nanoparticles used as PEMFC cathode support and catalyst, respectively.

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