

Non-precious metal cathode catalysts for PEM fuel cells and electrolyzers : an operando X-ray absorption study

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Nowadays, the shift towards renewable sources of energy seems like a crucial step to address the problems of increasing energy demand and escalating environmental pollution. Polymer electrolyte membrane (PEM) fuel cells (FC) and electrolyzers (EL) are two electrochemical devices that are seen as promising power sources for electric vehicles and efficient renewable electricity storage, respectively. A significant obstacle that could hinder the widespread deployment of PEMFC and PEMEL devices is the current dependence on precious metal catalysts, such as Pt and Ir, for accelerating the various reactions occurring at their cathodes and anodes. Hence, a significant number of scientific efforts are directed toward the search for alternatives based on non-precious group metal (PGM). The aim of this thesis is to explore how X-ray Absorption spectroscopy (XAS) can help to move the field of non-PGM-based catalysts one step further. Combinative efforts of rigorous EXAFS analysis with accurate XANES simulations have been used to unveil some important structural insights for different oxygen reduction and hydrogen evolution reaction (ORR and HER) catalysts. PEMFC and PEMEL devices have been re-designed to fit the needs of *operando* XAS experiments and the results of the first preliminary tests have been reported. Overall, this work has shown the fundamental contribution of XAS technique to the investigation of electrocatalytic systems by providing unique insights regarding their electronic and local structures. XAS can be unambiguously seen as a paramount spectroscopic tool for the further advancement of electrolyzer and fuel cell technologies.

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Vous êtes cordialement invités au pot qui suivra

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