# Limitations and improvement strategies for oxygen reduction reaction electrocatalysts in proton-exchange membrane fuel cells

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Conventional proton-exchange membrane fuel cells (PEMFC) electrodes are composed of a random mixture of carbon-supported Pt-based (Pt or Pt-based alloys) nanocrystallites (accelerating the rates of electrochemical reactions), proton-conducting ionomer (providing flow of protons) and gas or liquid-filled pores (providing access of the reagents to and the products from the catalyst's surface). Whereas much effort has recently been paid to improve their initial performance, the long-term stability of the porous structure and of the catalytic materials remains a very important challenge that needs to be addressed for widespread commercialization of the technology.

Indeed, the harsh operating conditions of a PEMFC cause a severe decline of its electrical performance on the long-term, [1] which is essentially related to the lack of stability of the catalytic materials. To unravel the degradation mechanisms at stake, fundamental investigations and catalytic measurements in well-controlled conditions are pivotal [2].

In this seminar, the degradation mechanisms of electrocatalytic materials in model and real PEMFC operating conditions will be presented. Improvement strategies towards more active and stable electrocatalysts will be proposed, with special emphasis on alternative catalyst's supports (graphitic carbon and metal-oxides)[3] and cathode materials (hollow Pt-based nanoparticles)[4] developed at LEPMI.

References

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