

Silica coating of PEM fuel cell Pt/carbon electrocatalysts to enhance durability upon operation

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Proton Exchange Membrane Fuel Cells (PEMFCs) are promising electrochemical devices for the production of zero-emission electricity. Platinum supported on carbon black (Pt/CB) is the primary catalyst used in practical PEMFC applications due to its high activity but the harsh operating conditions accelerate the catalyst degradation, compromising stability and long-term fuel cell efficiency¹.

As a potential solution, silica-coating methods have been reported in the literature to improve catalyst stability^{2,3}. A porous silica layer can act as a protective barrier, limiting particle dissolution and sintering while maintaining access for the reactants to the Pt particles. As catalysts support, Carbon Xerogels (CXs) are promising candidates due to their tunable meso/macroporosity, which allows optimization of mass transport properties⁴.

This project aims to develop silica-coating methods for Pt/CX catalysts, with a focus on achieving controlled layer thickness, uniform coatings and pores structure, through statistical analysis and optimization of synthesis parameters. The catalysts are characterized using physicochemical techniques (Fig. 1) as well as electrochemical measurements on Rotating Disk Electrode systems. Ultimately, the most promising catalysts will be integrated into a membrane-electrode assembly (MEA) for performance evaluation.

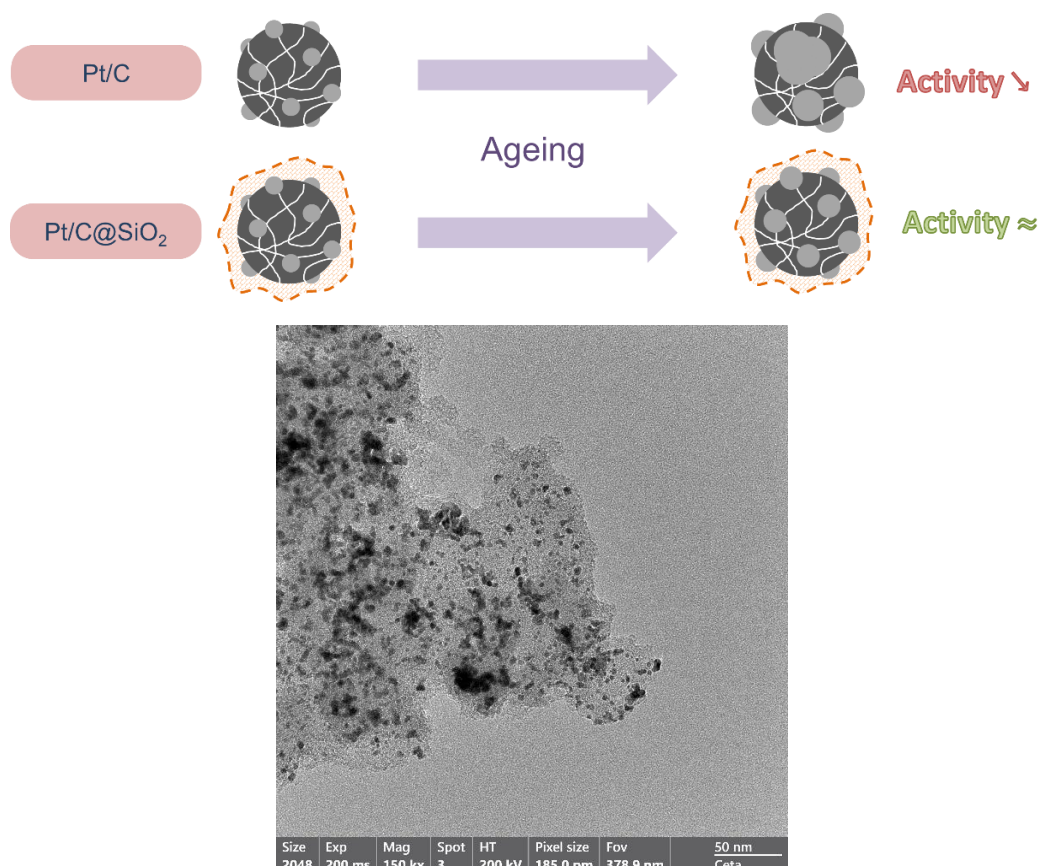


Figure 1: (up) Goal of the project and (bottom) TEM image of a Pt/CX sample covered by a silica layer

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