

Syntheses of platinum nanoparticles: effect on morphology, structure and electrocatalytic behaviour

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Colloidal methods have been extensively developed for the synthesis of platinum-based catalysts for Proton Exchange Membrane Fuel Cell (PEMFC) applications. Such methods are expected to produce metallic nano-sized particles with a narrow size distribution.

The germination process, the particle growth and the metallic particle stabilization steps lead to different Pt-surfactant stabilized colloids, depending on the synthesis route, and to different catalyst morphologies and structures. The talk will focus on the relationship between synthesis methods, catalyst structure and morphology, crystallite microstructure and electrocatalytic behaviour of the materials.

Synthesis methods of unsupported Pt nanoparticles will be first presented to obtain round-shaped particles or particles with a preferentially oriented surface. The electrochemical behaviour of these particles towards hydrogen adsorption/desorption process and CO stripping will be discussed. Then, different synthesis methods of carbon supported Pt nanoparticles will be presented. Physical characterizations (TEM, HRTEM, XRD, XPS) confirm the influence of the synthesis route on the composite material structure and morphology. The electrochemical active surface areas and the activities toward the oxidation of a pre-adsorbed CO saturating layer will be estimated using electrochemical methods.