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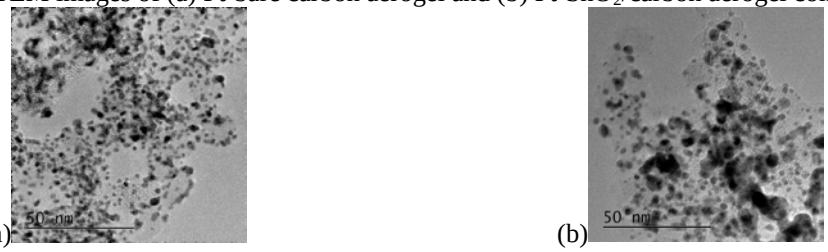
Proton Exchange Membrane Fuel Cells (PEMFC) are energy converters which can be used for automotive, stationary or nomad applications. This system is already used in niche markets. Nevertheless, some drawbacks, such as insufficient durability, need to be overcome to increase the market deployment. This insufficient durability is strongly linked to the corrosion of the carbon support in the cathode electrocatalyst [1]. The carbon corrosion leads to a local collapse of the support and a loss of catalyst which both dramatically reduce the fuel cell performances.

In this work, a coating of tin dioxide nanoparticles was deposited [2] on the surface of carbonaceous materials to create a composite that combines the electric conductivity of carbon with the stability of tin dioxide in fuel cell working conditions. The coating was optimized by increasing the tin dioxide precursor-carbon surface interaction and by adapting the quantity of the tin dioxide precursor to the specific surface area of the carbons. Different carbon materials with different organizations, morphologies and surface chemicals were evaluated: nanotubes, carbon blacks and carbon aerogel (CA). Organized (graphitic) carbons are more resistant to oxidation than amorphous ones [3], whereas carbon supports featuring high specific surface areas favors the dispersion of large amounts of catalyst nanoparticles per unit volume [4]. Bare carbon materials and tin dioxide/carbon composites were physically and chemically characterized by means of XRD, SEM, TEM, EDX, nitrogen sorption, TGA and electric conductivity.

Platinum nanoparticles (targeted platinum loading = 40 wt. %) were deposited on the bare carbons and on tin dioxide /carbon composites (TEM images for a CA support is shown at Fig.1). The catalytic activity of these electrocatalysts towards the oxygen reduction reaction was determined by linear sweep voltammetry (rotating disk electrode technique) at 25°C. Their stability is characterized by accelerated stress tests: load charge ($0.6 < E < 1.0$ V *vs* RHE) and start-up/shutdown ($1.0 < E < 1.5$ V *vs* RHE) protocols, conducted at $T = 80$°C in a four-electrode cell [5]. The electrochemical results depend on the nature of the carbon support (graphitized or not) and on the quality of the tin dioxide coating.

Fig.1 TEM images of (a) Pt-bare carbon aerogel and (b) Pt-SnO_2/carbon aerogel composite



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