New preparation methods of old Pt based electrocatalysts. Application to the Direct Alcohol Fuel Cell (DAFC)

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Platinum-ruthenium based catalysts are used for many decades as active electrode materials in the electro-oxidation of methanol and other low weighted fuels [1]. These catalysts can be prepared by the reduction of soluble metallic salts by different ways, such as the colloidal method developed by Bönnemann et al. [2], the coimpregnation - calcination - reduction method [3], or the electro-deposition process by galvanostatic pulses [4].

In this communication these different preparation methods of plurimetallic platinum based catalysts are discussed in terms of particle size distribution, atomic composition, and interactions with the supporting material (namely VulcanXC-72 carbon powder). The physical properties of the electrocatalysts were determined by TEM, EDX and XRD, whereas methanol oxidation was studied as a function of composition, temperature and methanol concentration, using coupled cyclic voltammetry, DEMS and SNIFTIRS techniques.

The electrocatalytic activity of the different electrode materials was then evaluated towards the anodic oxidation of methanol and ethanol.

The results obtained shown that for methanol oxidation the best electrocatalyst was Pt-Ru with a (80:20) optimum atomic ratio, whereas for ethanol oxidation a (90:10) Pt-Sn catalyst led to the highest electroactivity.

The determination of the electrical characteristics (cell voltage, E, and specific power, P, vs. the electrical current density, j) corroborates these results.

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[4] C. Coutanceau, A. Lima, E. Garnier, J.-M. Léger and C. Lamy, Proceedings of the 200th Meeting of The Electrochemical Society and the 52nd Meeting of the International Society of Electrochemistry, San Francisco, CA, 2001, Abstract No. 325.