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ELECTROCHEMICAL BEHAVIOUR OF CO TOLERANT Pt-Ru ALLOYS AS ANODE CATALYST FOR POLYMER ELECTROLYTE FUEL CELLS

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Polymer Electrolyte Fuel Cells, PEFCs, could provide in a near future a primary power source for electrical vehicles fed with reformed hydrogen-rich gas. This latter contains CO, which even at ppm levels, drastically affects cell performances, poisoning the active sites of the electrocatalyst (Pt supported on carbon, Pt/C) at the anode. To solve this problem, platinum alloys as Pt-Ru/C are used.

In the present work the influence of Ru content (25÷75 at %) in the Pt-Ru/C catalyst of three layers anode, with regard to hydrogen and carbon monoxide oxidation, was investigated. TEM and SEM/EDS experiments were carried out to study respectively the dimension of alloys particles and surface composition of the samples.

Electrochemical impedance spectroscopy (EIS) and cyclic voltammetry techniques were used to characterise the electrochemical behaviour of the anodes in H_2SO_4 1M at 25 °C. The effect of Ru content on CO adsorption was also investigated by CV with regard to the oxidation of an irreversibly adsorbed CO monolayer. With regard to hydrogen oxidation, the catalytic performances were Pt/C>Pt-Ru/C>>Ru/C and within the alloys, Pt/Ru=1/1 atomic ratio showed the best performance. The addition of 100 ppm of CO to the hydrogen gas stream, left the catalytic performance of Ru/C unchanged, decreased about two times that of Pt-Ru/C and 700 times that of Pt/C (Fig.1). In this case the performance scale was Pt-Ru/C>>Ru/C>Pt/C.

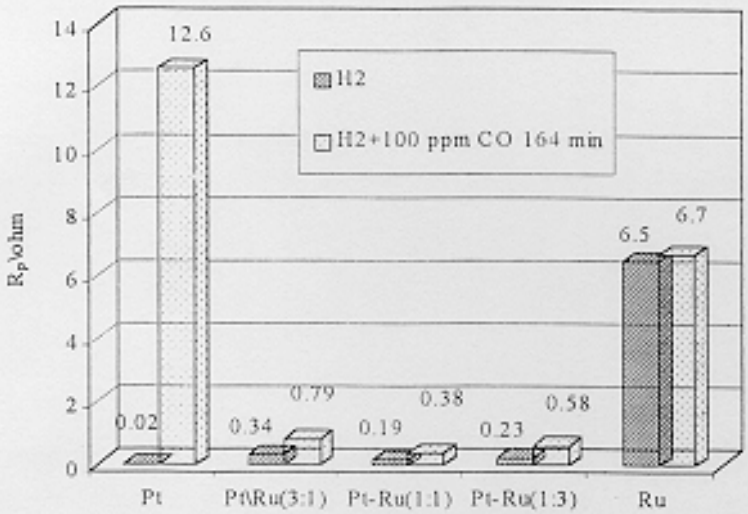

Fig.1 - Polarisation resistance from EIS data for Pt/C, Ru/C, Pt-Ru/C electrodes in H_2SO_4 1 M at 25°C in H_2 + CO 100 ppm, after 164 min at OCV.