Fig. 5: Eighteenth cycle to 1V of Pt(110) in 0.1N NaOH. Sweep rate 50 mV/s.

REFERENCES:

[1] C. Lamy J.M. Leger and J. Clavilier; J. Electroanal. Chem., 135 (1982) 321.

[2] F.T. Wagner and P.N. Ross,Jr., J. Electroanal. Chem., 250 (1988) 301.

[3] R.R. Adzic, M.L Avramov-Ivic and A.V. Tripkovic, Electrochimica Acta, 29 (1984) 1353.

[4] C.L. Scortichini and C.N. Reilly, J. Electroanal. Chem., 139 (1982) 247.

[5] D. Takky, B. Beden, J.M. Leger and C. Lamy, J. Electroanal. Chem., 256 (1988) 127.

[6] J. Clavilier, R. Faure, G. Guinet and R. Durand, J. Electroanal. Chem., 107 (1980) 205.

[7] D. Armand, Tesis, París 1986.

[8] F. Cases, E. Morallón and J.L. Vázquez, Fourth meeting of the portuguese electrochemical society, 1989, Costa do Estoril (Lisboa).

ELECTROCHEMICAL BEHAVIOUR OF THE BASAL PLATINUM (110) SINGLE CRYSTAL IN 1 M PHOSPHORIC ACID MEDIUM.

F. Cases, E. Morallón and J.L. Vázquez.
Departamento de Quimica-Fisica. Universidad de Alicante.
Apartado 99. Alicante (ESPAÑA).

INTRODUCTION:

The interest in the more efficient use of organic fuel cells has increased considerably after the energy crisis of 1973. For this reason, the attention of a number of electrochemist has focused on electrochemical energy conversion including the direct oxidation of organic molecules. Phosphoric acid is one of the most attactive electrolytes for practical medium temperature ($>200°C$) fuel cells [1], in spite of its dilute solutions low conductivity at room temperature. It has been well established that, as for sulfuric acid, there is specific adsorption of anions in H_3PO_4 on Pt surfaces [2].

The aim of the present study was to determine the hydrogen adsorption-desorption behaviour on Pt(110) electrode, in 1M phosphoric acid as electrolyte. As it can be seen, this behaviour is very close to that obtained by Clavilier in sulfuric acid [3].

EXPERIMENTAL:

The test solution was 1M phosphoric acid, that was prepared by mixing 85% phosphoric acid (Pro-analysi, Merck) with 30% H_2O_2 (Pro-analysi, Merck), and this solution was heated to 90°C until gas evolution ceased. The acid was then heated to 160°C to reduce the water

content and destroy any remaining traces of H_2O_2; this solution was pre-electrolyzed for 12 h. The water used for preparation of the solutions was from a Millipore-MilliQ system. All potentials are referred to the reference hydrogen electrode (RHE). A platinum counter electrode was used and the cyclic voltammograms were recorded at room temperature at a sweep rate of 50 mV/s.

The initial potential for the voltammometric curves was 0.75 V and the sweep was always started in the negative sense.

The Pt(110) electrode, kindly prepared by J. Clavilier, has been thermically treated before each experience following the experimental procedure described in [4].

RESULTS AND DISCUSSION:

It has been focus our attention in the hydrogen adsorption-desorption region, figure 1, two main stables overlapped reversible peaks are obtained, whenever the upper potential is limited to 0.750 V, at 0.125 V and 0.130 V potentials that can be assigned to weakly adsorbed hydrogen. The overall adsorption zone is slightly assimetric because of the appearance in the desorption zone of a small peak at 0.210 V that has not got a counterpart in the hydrogen adsorption zone. In order to appear this peak needs a high quantity of adsorbed hydrogen as can be seen in figure 2.

The charge corresponding to hydrogen adsorption (209 $\mu C/Cm^2$) is higher than the theoretical charge (147 $\mu C/Cm^2$) for a (1x1) structure and is very closed to the value obtained by Clavier in 0.5 M H_2SO_4 for a (1x2) structure (210-220 $\mu C/Cm^2$). So a superficial reconstruction for a (1x1) structure to a (1x2) structure can be assumed to have taken place.

If the upper potential limit is raised to 1.35 V, figure 3, the unfolded peak is transformed to a single peak at 0.125 V and the height of the small peak at 0.210 V increases. More cycling between the potential limits of 0.050 V and 1.350 V causes an increase in height of the main peak. If the upper limit drops until there is no oxygen adsorption the height of the main peak is constant and the small peak diminishes. So hydrogen adsorption in this interval of potential doesn't cause the restoration of the original structure.

REFERENCES:

[1] Adzic, R.R., O'Grady. W.E., Srinivasan, S., J. Electrochem. Soc., 128(9) (1981) 1913.

[2] Ross, P.N., Andricacos, P.C., J. Electroanal. Chem., 154 (1983) 205.

[3] Armand, D., Clavilier, J., J. Electroanal. Chem., 233 (1987) 251.

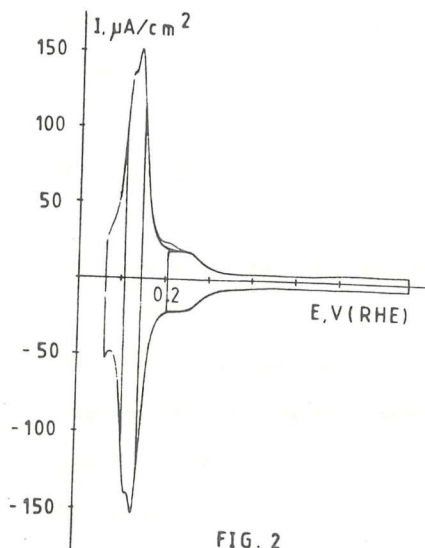[4] Clavilier, J., Faure, R., Guinet, G., Durand, R., J. Electroanal. Chem., 107 (1980) 205.

FIG. 2

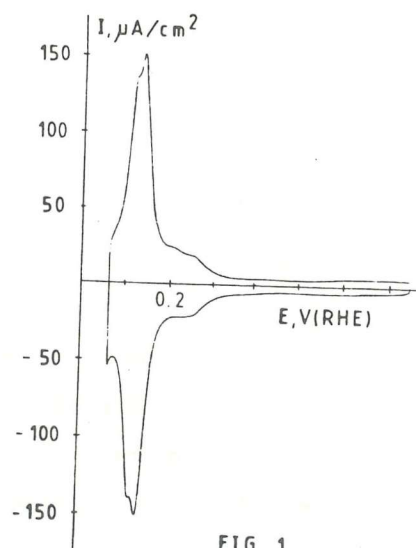1M H_3PO_4. Differents amounts of H coverage.

FIG. 1

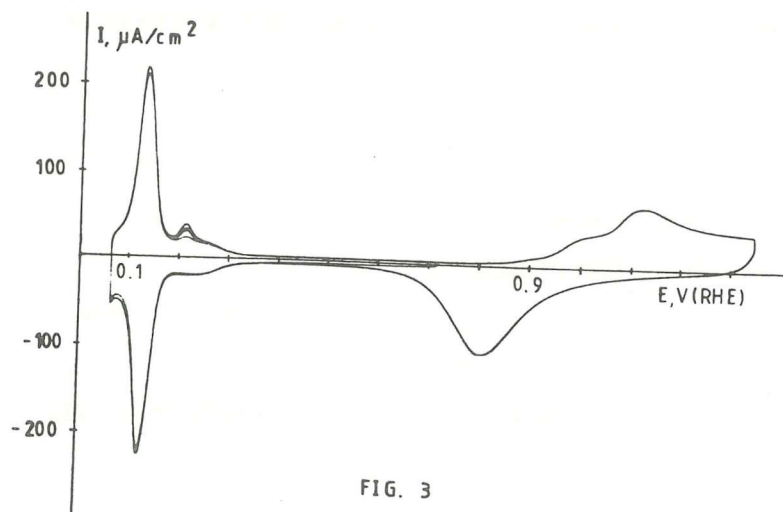1M H_3PO_4. Sweeps between 0.750 V and 0.065 V.

FIG. 3

1M H_3PO_4. Evolution of the voltammogram when the upper limit is 1.35 V.

HIGH TEMPERATURE BEHAVIOUR OF HOT DIP (Zn and Al) STEEL

P. Molera

Dpt. Enginyería Química i Metal.lúrgia. Universitat Barcelona
c/ Martí Franqués, 1. 08028 Barcelona. SPAIN.

ABSTRACT.
The corrosion behaviour of hot dip (Zn and Al) steel parts heated at diferent temperatures and for varying periods of times has been investigated. Mathematic-statistical treatment of results obtained has been applied. This work show the better protection of steel at high temperature with the aluminized in front of galvanized.

INTRODUCTION.
It is well know that hot dip aluminized steel is more resistent that galvanized [1] steel to environmental corrosion [2]. The objective of the present work is prove the corrosion resistance at high temperature of this protection's system.

EXPERIMENTAL PART.
The raw material used are specimens of ferritic steel with a 0,04 % carbon. The aluminium contained 4,1 % silican. The flux bath consisted of a mixture of sodium chloride, potassium chloride and cryolite in this proportion of 2:2:1 by weight. The galvanized contained inmexed zinc.
The aluminized specimens were subjected to the following operations: degreasing, washing, pickling, washing, drying, fluxing, aluminium bath, dripping and cooling. First they were immersed in a sodium hydroxide bath at 485ºC for 15 minutes. Then they were washed and placed in a 10% sulphuric acid solution containing thiourea at 70-80ºC for 15 minutes. Once the test specimens were washed and dry, they were placed in a fused salts bath where they were kept at 700ºC for 10-15 minutes. Next they were immersed in the liquid aluminium, which was kept at 700-750ºC. After that the surplus aluminium was removed from the test specimens by reimmersion in the fusing bath or by centrifuging. Then they were cooled in water.
Once the test specimens had been aluminized and galvanized, they where exposed in a electric heat-treatment furnace (AIM model 96) with air atmosphere. The specimens were weighed before introduction in the furnace at prefixed temperature and after scaling and drying process.
Every specimen was scaled with a volume of 60 ml. aprox. scaling dissolution, shaken with a spatula for five minutes. The washing was carried out with distilled water (80 ml aprox.), twice consecutively, shaken with a spatula and in different glasses. Finally, the drying was carried out in a stove at 150ºC for 1 hour, following the method proposed by D.ITZMAK and S.MARUSH [3]. The weight of the part, scaled and dried, was obteined, for every one of them, eight minutes after coming out them of the stove.