CHLORINE CONTENT IN PLATINUM ELECTROPLATES

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A number of studies have been devoted to the effect of plating conditions on the properties of platinum electroplates [1-4]. Since platinizing is usually carried out in H_2PtCl_6 solutions, the possibility cannot be ruled out that Cl^- will penetrate the platinum deposit. The literature, however, is lacking in quantitative data on the Cl^- content Pt/Pt electrodes. Approximate data [5] indicate a range of 10^{-11} to 10^{-12} g-eq/cm^2.

The purpose of this work is to provide quantitative information on the chlorine content of platinum deposits. The plating solution was 2% Na_2PtCl_6 + HCl prepared through dissolution of H_2PtCl_6, "ch." ["pure"] grade, in 0.1 N NaCl tagged with ^{36}Cl. Preparation of the electrodes to be platinized was similar to [6]. The platinum was first polarized cathodically in an argon-aerated solution of 0.1 N H_2SO_4 in the operational cell compartment. A solution of the chloroplatinate, previously aerated with argon, was then poured into the cell. The platinum was plated for 3 h at $\varphi_h = 50$, 125, and 200 mV (relative to a hydrogen electrode placed in the same solution) in a cell with separate anodic and cathodic compartments. The deposited platinum amounted to 10 to 20 mg/cm^2 of visual surface. The platinum-plated electrode was left in the cell and rinsed repeatedly with 0.1 N H_2SO_4 previously sparged with argon, cathodically polarized in the sulfuric acid in an argon atmosphere, and rinsed with double distilled water saturated with hydrogen. Radioactivity of the electrode was measured with a type SI-2B end-window counter. Depending on the electrode plating potential, the amount of chlorine found was: for $\varphi_h = 50$ mV, $\sim 1.2 \pm 0.2\ \mu C/cm^2$; for $\varphi_h = 125$ mV, $\sim 3.5 \pm 0.1\ \mu C/cm^2$; and for $\varphi_h =$ 200 mV, $\sim 7.2 \pm 0.1\ \mu C/cm^2$. These values are computed for the true surface and do not take into account any absorption of chlorine ion radiation into the bulk of the platinum deposit. Chloride ions could not be removed from the electrode by prolonged cathodic and anodic polarization, probably due to their penetration into the bulk of the platinum deposit. In agreement with data in the literature [7], change curves obtained for electrodes not subject to anodic oxidation were similar in form to those of electrodes that were anodically and then cathodically polarized; however, during the anodic and cathodic polarizations, the electrode surface area diminished.

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