Área: ELE

Stainless Steel as Catalytic Support for Glycerol Oxidation

Paula Barione Perroni (PG),[1] Teko W. Napporn (PQ),[2] Hamilton Varela (PQ),[1]

paula.perroni@usp.br; hamiltonvarela@gmail.com

[1] Instituo de Química de São Carlos, USP; [2]Université de Poitiers, IC2MP

Palavras Chave: *stainless steel, glycerol oxidation, platinum, alkaline medium, oscillation*

Highlights

Platinum is easily deposited at stainless steel surface. The catalyst obtained is good for glycerol oxidation.

Resumo/Abstract

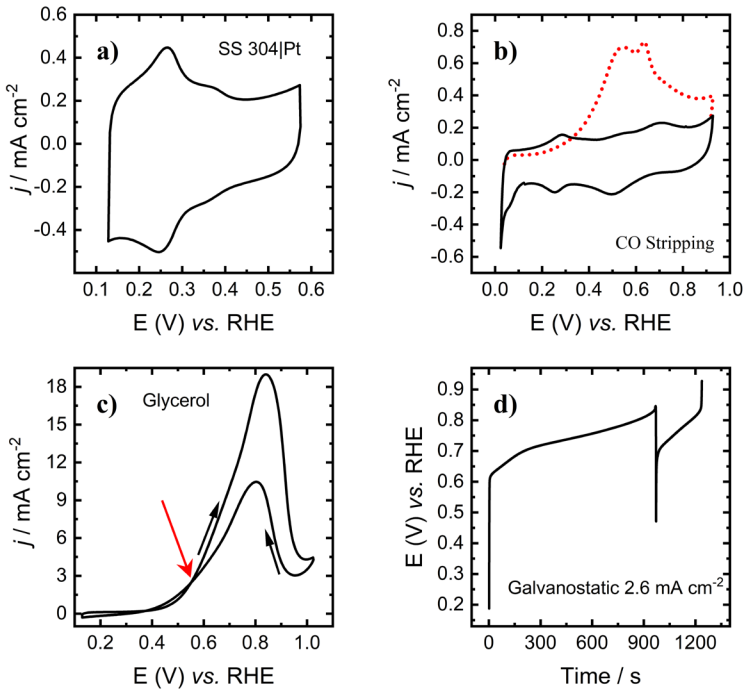

Figure 1: a) cyclic voltammetry of Pt deposited at SS304 in KOH 1M and scan rate of 20 mV s-1 b) CO stripping at scan rate of 10 mV s-1; c) glycerol 0.2 M electrooxidation at SS304|Pt and scan rate of 20 mV s-1; d) chronopotentiometry at j=2.6 mA cm-2.

The Pt is deposited at stainless steel surface by chemical reaction between the Pt and the alloy surface. Firstly, the SS304 was etched in H_2SO_4 30 w.t.% at 60ºC for 5 min, then it is washed and right after the electrode was submitted in a slightly acid solution of 3.9 x 10^{-5} mol L^{-1} of H_2PtCl_6 and HCl 0.06%, under controlled temperature of 70ºC during 20 minutes.[1] The electrode was tested for 0.1 M glycerol oxidation at solution KOH 1M, and the results are summarized in Fig. 1. Both cyclic voltammetry of the material without the organic and CO stripping confirm the Pt deposition at the steel. In Fig 1a) is possible to identify the typical Pt hydrogen region below 0.4 V and the respective double-layer above it. The window potential was set until 0.6V so the surface would not go under oxide modifications. Two peaks appear in CO stripping between 0.5 and 0.8V, as can be seen in Fig 1b), ascribed to CO oxidation at different size Pt particles.[2] The Fig 1c) shows a typical glycerol oxidation voltammetry profile where the main peak corresponds to its partial oxidation to glyceraldehyde and subsequently to glyceric acid.[3] A systematic study was made under galvanostatic study and only at 2.6 mA cm^{-2} (the current density is highlighted in the CV image by the red arrow) was possible to access oscillatory profile, as demonstrated in Fig 1d). After 800 seconds just one cycle with 0.37 V of amplitude appeared. In a summary we showed that the stainless steel is a good substrate for Pt deposition and further organic molecule oxidation. Both H_2 adsorption/desorption region in CV and CO stripping confirm the Pt presence and the material appears to be good catalyst for glycerol oxidation. However, under galvanostatic conditions more study is necessary.

References

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