

Comparative Study of Acetaldehyde Electrooxidation onto Rh, Pt and Rh Modified by Pt Submonolayers

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Introduction

The catalytic dissociation of small organic molecules on electrode surfaces is a topic of relevant interest in electrochemistry.¹ The great challenge in ethanol oxidation is the cleavage of the C-C bond. One of the path is *via* oxidation of adsorbed ethanol to form acetaldehyde and acetic acid. This path is not so interesting, once only two and four electrons are released in this process, respectively. The aim of this work is to get insight into the role of Pt adatoms onto Rh polycrystalline surface in the activity acetaldehyde oxidation. It is interesting to analyze the acetaldehyde oxidation, once this molecule is an intermediate in the electrooxidation of ethanol to acetic acid.²

Results and Discussion

The Rh and Pt electrodes were characterized electrochemically in H₂SO₄ 0,1 M. The Fig. 1 shows the CV profile and its peculiar regions.

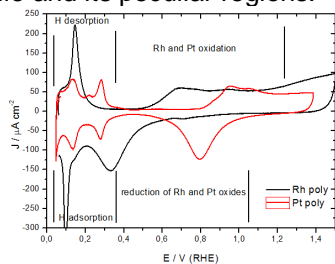


Figure 1. CV of Rh and Pt poly (50 mV s⁻¹).

The activities of these electrodes for acetaldehyde oxidation were studied by CV (Fig. 2A, B and 3). The electroactivity comparison for Rh and Pt poly showed peculiar characteristics for both surfaces. For Rh electrode the dependence on concentration was not so significant, the onset potential starts at 0.6 V. For Pt poly the concentration influence is noted, being that for low concentration the current density rises at lower potential. The maximum current is twice when compared with Rh poly. However, an interesting characteristic observed for Rh surface is a capable to break down the C-C bond from acetaldehyde, once for ethanol oxidation this phenomenon is not observed. Then a study of Rh

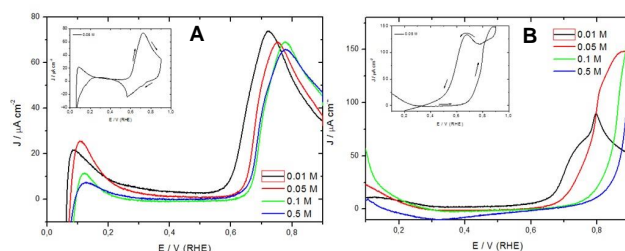


Figure 2. Anodic profile of acetaldehyde oxidation in different concentrations onto: A) Rh and B) Pt.

poly modified by Pt submonolayers was done with the goal to analyze the two combined metals towards to acetaldehyde oxidation. The Fig. 3 presents the behavior of small amounts of Pt onto Rh surface. Thus Rh poly was modified by small amounts of Pt, the activity of the electrode increases significantly. It should be highlighted that the coverage in this case is only 0.05 and the currents densities are so considerable.

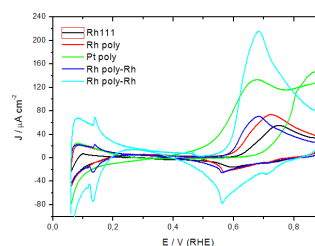


Figure 3. CV of acetaldehyde oxidation onto different surfaces.

Conclusions

Acetaldehyde electrooxidation onto Rh poly, Pt poly and Rh poly modified by Pt adatoms showed different activities, being that the latter when recovered by 0.05 ML presented great performance.

Acknowledgments

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