The influence of glycerol in the formation of Pt oxygenated species

Rafael A. G. Oliveira[1] (IC), Camilo A. Angelucci[1] (PQ), Janaina Souza-Garcia[1](PQ)*

janaina.garcia@ufabc.edu.br

[1]*Centro de Ciências Naturais e Humanas – Universidade Federal do ABC, Av. dos Estados 5001, Bairro Bangu, CEP 09210-580, Santo André, SP, Brazil*

Key-words: *oxygenated species; platinum; glycerol; nitrate.*

Introduction

Despite the fact that there are many works about the behavior of Pt electrodes in several pHs, it is not possible to assure that the oxidation potential of Pt surface remains the same when other species are added to the electrolyte.

The goal of the work is to investigate the influence of glycerol concentration at the potential of Pt oxygenated species formation in alkaline media.

Results and Discussion

Figure 1 presents the cyclic voltammograms for glycerol electrooxidation in alkaline media (0.1M NaOH) at polycrystalline Pt. It is possible to see that as the glycerol concentration increases the potential of the oxidation peak shifts to more positive values.

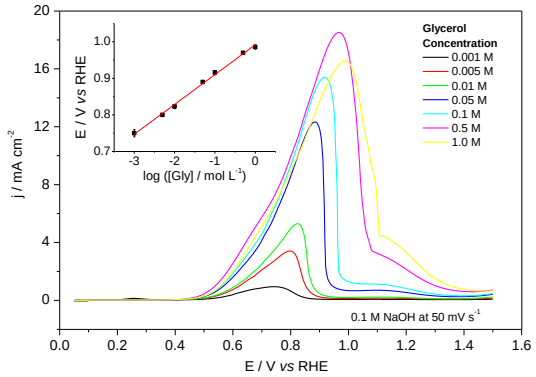

Figure 1. Positive scan of glycerol electrooxidation at Pt polycrystalline electrode in 0.1M NaOH at 50 mVs^{-1}.

The behavior has been observed with others alcohols for Pt electrodes [1,2]. Even if the authors do not usually mention the subject; it is often assumed that the potential at which the formation of superficial oxygenates species is observed do not change with the addition of others species, as alcohols, in solution.

A hypothesis that might be suggested is that the competition for OH^- species between Pt atoms and the alcohol in solution could lead to a shift at the potential of oxygenated species formation. Because of that, the alcohol would suffer oxidation until more positive potentials (until before the oxidation of the surface).

In this case, the alcohol concentration would be responsible for the displacement of the surface oxidation and this would lead to a shift of alcohol oxidation peak.

The reaction of nitrate electrorreduction was used as a probe to investigate if the concentration of the species in solution influences the peak reaction in a potential region which there is no oxygenated species formation.

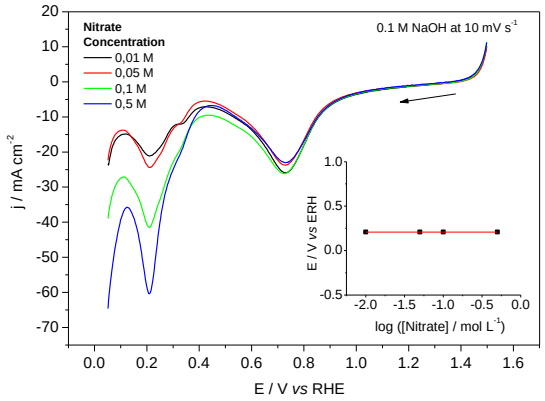

Figure 2. Negative scan of nitrate reduction at Pt polycrystalline electrode in 0.1 M NaOH at 10 mVs^{-1}.

It is clear that the reduction peak is not shifted with the increase of nitrate concentration. This result indicates that, if there is no competition between species, the concentration of the analyte does not displace the peak potential.

Conclusions

It is not clear if there is any change in the oxidation potential of the surface when glycerol is added to the solution. However, the results here presented open a discussion about the possibility of displacement at the oxidation potential due to the competition between the molecule to be oxidized and Pt atoms on the electrode surface.

Acknowledgements

The authors thanks CNPq for the scholarship granted (PIBIC-IC) and FAPESP (2013/ 13749-0).

[1] Hitmi, H; Belgsir, E.M.; Léger, J.M.; Lamy, C. e Lezna, R.O., *Electrochimica Acta* **1994**, *39*, 407.
[2] Giz, M. J.; Camara, G.A., *Journal of Electroanalytical Chemistry* **2009**, *625,* 117.