Energy Transition
RESEARCH & INNOVATION

SÃO PAULO, BRAZIL | NOVEMBER 7-9, 2023

Energy Transition Research & Innovation Conference

ETRI 2023

BOOK OF ABSTRACTS

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Energy Transition Research & Innovation Conference

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São Paulo, November 7-9, 2023

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We gratefully acknowledge the support of the RCGI – Research Centre for Greenhouse Gas Innovation (23.1.8493.1.9), hosted by the University of São Paulo (USP) and sponsored by FAPESP – São Paulo Research Foundation (2020/15230-5) and Shell Brasil, as well as the strategic importance of the support given by ANP (Brazil's National Oil, Natural Gas and Biofuels Agency) through the R&DI levy regulation.

DOI: 10.5281/zenodo.12744754

the cation present in solution, which might be related to the size of the ions and insertion between the layers of Ni-Fe in the electrode.

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Abstract Title: The electro-oxidation of ethanol under oscillatory regime on platinum-tin electrodes

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Abstract: The electro-oxidation of ethanol under oscillatory regime on platinum-tin electrodes The electrocatalytic oxidation of small organic molecules is of general importance for energy-related issues such as the fuel cells and electrochemical reform. The characteristics that emerge along the catalytic oxidation of small organic molecules critically depend on the coverage and nature of absorbates [1-3]. The common emergence of current and potential oscillations in these reactions is closely related to the reaction mechanism and implies the overall conversion, and thus on the performance of practical devices [4]. In the present work we study the dynamics of electrochemical oxidation of ethanol under oscillatory regime using tin-modified platinum electrode. Experiments were performed in a classical three electrode cell, polycrystalline platinum flags were used as working electrodes (WE), a graphite stick was served as counter electrode, and a reversible hydrogen electrode (RHE) was used as reference electrode. The investigation was focused on the role played by surface free sites and the presence of a step with a short-lived specie adsorbed at the electrode surface. To reduce the coverage of poisoning species, and thus to increase the main reaction pathway, chronoamperometry in platinum oxide region followed by potential sweeps or the adsorption of ad atoms, like tin, tin-modified platinum electrodes were used to assess the decrease in coverage of poisonous species. The experimental part includes protocols to invest control the effect of surface
coverage using chronoamperometry and cyclic voltammetry, as well as studies under oscillatory regime. The results show that the efficiency of ethanol electro-oxidation is preferred powered, on a less poisoned electrode surface, which is obtained through a self-cleaning process driven by the oscillatory electro-oxidation. These results are rationalized in terms of reaction mechanisms on both platinum and platinum-modified systems.

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Keywords: Electrocatalytic, scillatory regime, ethanol.

Introduction and Objectives: The electrocatalytic oxidation of small organic molecules is of general importance for energy-related issues such as the fuel cells and electrochemical reform. The characteristics that emerge along the catalytic oxidation of small organic molecules critically depend on the coverage and nature of absorbates. The common emergence of current and potential oscillations in these reactions is closely related to the reaction mechanism and implies the overall conversion, and thus on the performance of practical devices. In the present work we study the dynamics of electrochemical oxidation of ethanol under oscillatory regime using tin-modified platinum electrode.

Methodology: Experiments were performed in a classical three electrode cell, polycrystalline platinum flags were used as working electrodes (WE), a graphite stick was served as counter electrode, and a reversible hydrogen electrode (RHE) was used as reference electrode. The experimental part includes protocols to invest control the effect of surface coverage using chronoamperometry and cyclic voltammetry, as well as studies under oscillatory regime.

Preliminary results: The results show that the efficiency of ethanol electro-oxidation is preferred powered, on a less poisoned electrode surface, which is obtained through a self-cleaning process driven by the oscillatory electro-oxidation.

Preliminary conclusions: The oscillatory electro-oxidation reaction of ethanol with the ordered intermediates of platinum and tin considerably affects the oscillatory dynamics, compared to the reaction at an unmodified platinum electrode. Overall, the results show a substantial increase in catalytic activity on platinum and platinum tin surfaces for the electro-oxidation of ethanol. These results are rationalized in terms of reaction mechanisms.

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Abstract Title: Study of Ethanol Electrooxidation in Oscillatory Regime for Gaining Mechanistic Insights.

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