

Accepted Manuscript

Probing ethanol oxidation mechanism with in-situ FTIR spectroscopy via photodeposited Pt nanoparticles onto titania

Juan Corchado-García, Cláudia Morais, Nicolás Alonso-Vante, Carlos R. Cabrera



PII: S1572-6657(17)30436-8
DOI: doi: [10.1016/j.jelechem.2017.06.007](https://doi.org/10.1016/j.jelechem.2017.06.007)
Reference: JEAC 3338
To appear in: *Journal of Electroanalytical Chemistry*
Received date: 24 September 2016
Revised date: 3 June 2017
Accepted date: 5 June 2017

Please cite this article as: Juan Corchado-García, Cláudia Morais, Nicolás Alonso-Vante, Carlos R. Cabrera, Probing ethanol oxidation mechanism with in-situ FTIR spectroscopy via photodeposited Pt nanoparticles onto titania, *Journal of Electroanalytical Chemistry* (2016), doi: [10.1016/j.jelechem.2017.06.007](https://doi.org/10.1016/j.jelechem.2017.06.007)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Probing Ethanol Oxidation Mechanism with In-Situ FTIR Spectroscopy via Photodeposited Pt Nanoparticles onto Titania

Juan Corchado-García,^{1,2} Cláudia Morais², Nicolás Alonso-Vante,² Carlos R. Cabrera¹

¹University of Puerto Rico, Río Piedras Campus, San Juan, Puerto Rico 00931

²IC2MP, UMR-CNRS 7285, University of Poitiers, 4 rue Michel Brunet, 86022 Poitiers, France

Corresponding Author email: carlos.cabrera2@upr.edu

Abstract

Hybrid Pt/TiO₂-C catalysts were synthesized via photodeposition in this study in order to increase the kinetics and the carbonate yield of the Ethanol Oxidation Reaction. Photodeposition was chosen because it was believed that the Pt nanoparticles would deposit predominately on top of the oxide sites, which would change the reactivity of the Pt nanoparticles. First, TiO₂-C composites with varying TiO₂ mass percentages were synthesized by sol gel using Vulcan Carbon XC-72R and Titanium Isopropoxide as precursors. The composites were dispersed in isopropanol and mixed with Chloroplatinic Acid such that the final Pt concentration was 20% by weight. This mixture was illuminated with UV light for 3 hours and the Pt/TiO₂-C catalysts were recovered. Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES) analysis showed that the Pt photodeposition was almost quantitative and XRD patterns showed that the average particle size ranged from 4 to 5 nm. XPS Spectra showed that the Pt nanoparticles shifted to lower binding energies as TiO₂ concentration increased, whereas Ti binding energies shifted to higher values with higher TiO₂ concentrations. The synthesized catalysts showed increased current density in Linear Sweep Voltammetry when compared to a commercial Pt/C catalyst experiments which was attributed to increased nucleophilicity on the Pt which allowed for kinetically easier nucleophilic attacks. In-situ FTIR studies showed that the bands attributed to carbonate vibrations were more intense on the synthesized catalysts. All of these experiments allowed us to conclude that the increased electron density facilitates nucleophilic attacks and C-C bond breaking.

Keywords: EOR, Electrocatalysis, Direct Ethanol Alkaline Fuel Cell, In-situ FTIR

Download English Version:

<https://daneshyari.com/en/article/4907743>

Download Persian Version:

<https://daneshyari.com/article/4907743>

[Daneshyari.com](https://daneshyari.com)