Journal of Nanomaterials & Molecular Nanotechnology
ISSN 2324-8777
2020
Vol.9 No.5

Cost-effective non-noble metal supported on conducting polymer composite such as Nickel nanoparticles/Polypyrrole as efficient anode electrocatalyst for ethanol oxidation

Sanaa Chemchoub [1, 2], Larbi Oularbi [1], Fouad Bentiss [2], Charafeddine Jama[2] and Mama EL Rhazi[1]

[1] Laboratory of Materials, Membranes and Environment. Faculty of Science and Technology. Hassan II University Casablanca, Morocco
[2] Materials and Transformations Unit Laboratory (UMET), France

Abstract

Statement of the Problem: Energy consumption and production that rely on the combustion of fossil fuels is forecast to have a severe future impact on world economics and ecology [1, 2]. As a result, it was settled to decrease worldwide pollution to support the ecological balance by adopting Direct Ethanol fuel cells as clean, low-cost, and sustainable power source substitute [3, 4, 5]. The purpose of this study is to accelerate the kinetics of anodic oxidation of ethanol in **Direct** Ethanol Fuel Cells therefore improving the fuel cell performance by using an electro catalyst with a low production cost, good catalytic activity, high resistance to poisoning species and long term stability. Methodology & Theoretical Orientation: poly-pyrrole (PPy) and nickel nanoparticles (NiNPs) based electro catalyst was synthesized by galvanostatic and potentiostatic modes respectively using an economical method by adopting a creative approach, which is the regeneration of the modified electrode. The electro catalytic activities of the carbon paste electrode modified (PPY) and n (NiNPs) named PPY-Ni/CPE towards ethanol oxidation have been studied at different concentration of Nickel varying from 6mM to 600mM in a 0.1 M NaOH and 0.2 M ethanol. Findings: an excessive amounts of nickel particles reduces the number of active sites of the material causing a sluggishness of the electron transfer path. Consequently, the optimal concentration of nickel which reveals the best electro catalytic activity of NiNPs/PPy/CPE nanocomposite for ethanol electro oxidation is 6mM. At this concentration, the value of the anodic current is dramatically amplified from 3.58mA/cm^2 to 20.1mA/cm^2 on the regenerated electrode proving the effectiveness of the regeneration approach on enhancing the current density and magnifying the anodic peak. Conclusion & Significance: The regeneration of the electrode reduces the electro catalyst tolerance towards poisoning intermediate carbonaceous species accumulated on the catalyst surfaces and increased the current density.

Biography:

Sanaa CHEMCHOUB has completed her post-graduation on Chemistry and Material Science from Hassan II University. She is currently a Catalysis and analytical Chemistry Ph.D. student at The National Superior School of Chemistry of Lille in France and she has published one paper in reputed journal, submitted her second article, the third being written. She has presented her research accomplishment in numerous International Congress.

Speaker Publications:

1. L. Ning, A. Zhu, M. Deng, Q. Zhang, Q. Liu, Novel H-PdSnNi Catalyst with Enhanced Ethanol Electrooxidation Performance in Alkaline Medium, Electrochimica Acta. 259 (2018) 1145–1153
2. J. Liu, Z. Luo, J. Li, X. Yu, J. Llorca, D. Nasiou, J. Arbiol, M. Meyns, A. Cabot, Graphene-supported palladium phosphide PdP2 nanocrystals for ethanol electrooxidation, Appl. Catal. B Environ. 242 (2019) 258–266.

18th International Conference on Emerging Materials and Nanotechnology; Webinar- August 31-September 01, 2020

Abstract Citation:

Sanaa CHEMCHOUB, Cost-effective non-noble metal supported on conducting polymer composite such as Nickel nanoparticles/Polypyrrole as efficient anode electrocatalyst for ethanol oxidation, Emerging Materials 2020:18th International Conference on Emerging Materials and Nanotechnology; Webinar- August 31-September 01, 2020.

(https://emergingmaterials.materialsconferences.com/abstract/2020/cost-effective-non-noble-metal-supported-on-conducting-polymer-composite-such-as-nickel-nanoparticles-polypyrrole-as-efficient-anode-electrocatalyst-for-ethanol-oxidation)