Methanol, Ethanol and Glycerol oxidation study by graphite-epoxy composite electrodes with graphene-anchored nickel oxyhydroxide nanoparticles

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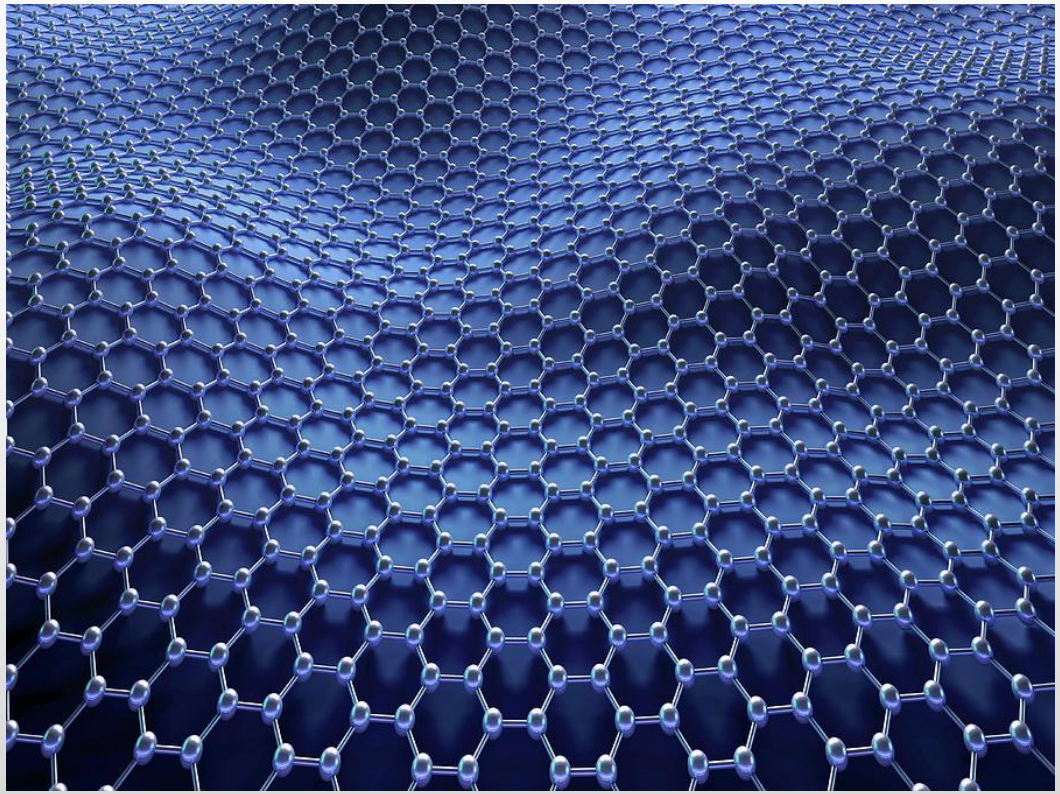
Outline

- Introduction
- Method
- Characterization
- Eletrooxidation of alcohols
- Principal Component Analisys
- Summary

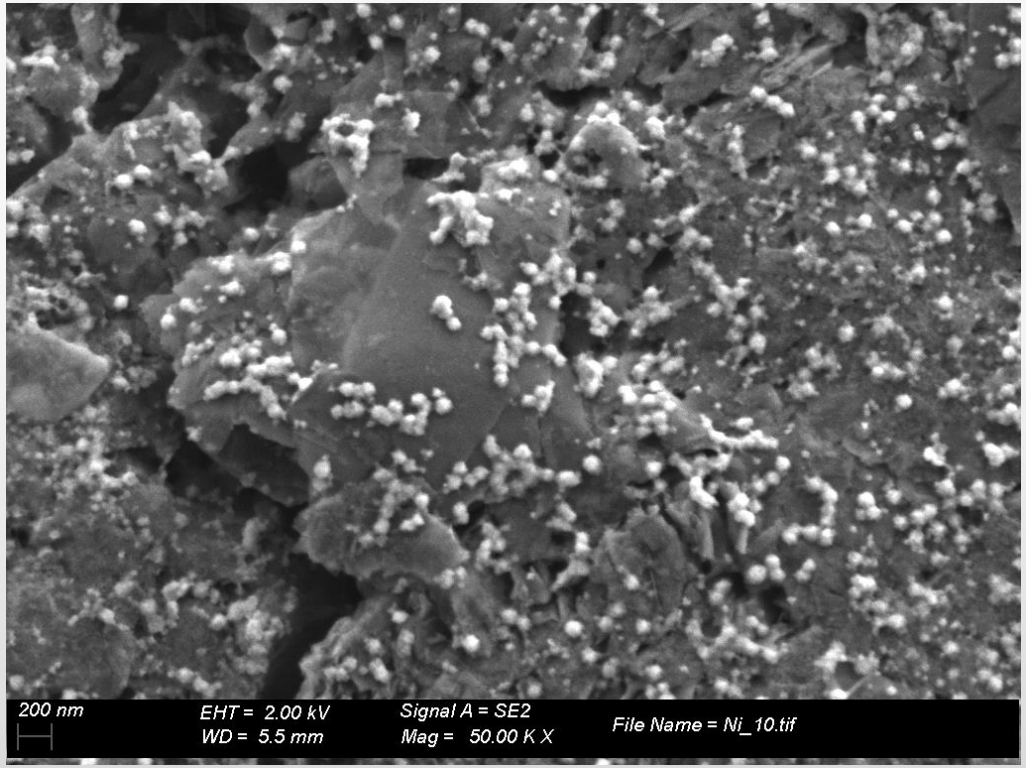
Introduction

- **Graphene Oxide**
  - 2D sheets formed by carbon atoms;
  - **Large specific surface area**;
  - **High conductivity**;
  - Great mechanical strength.



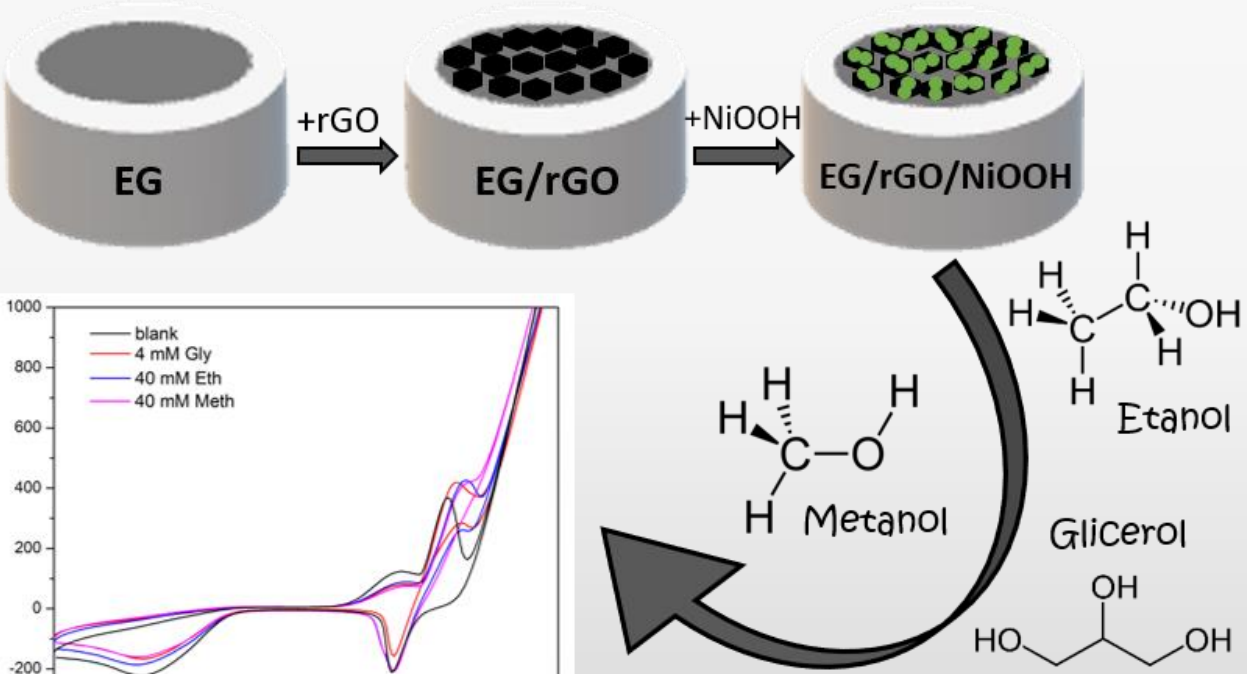
Introduction

- **Nanoparticles NiOOH**
  - The high surface area to volume ratio of nanoparticles;
  - **Good electrochemical activity in the oxidation of alcohols.**



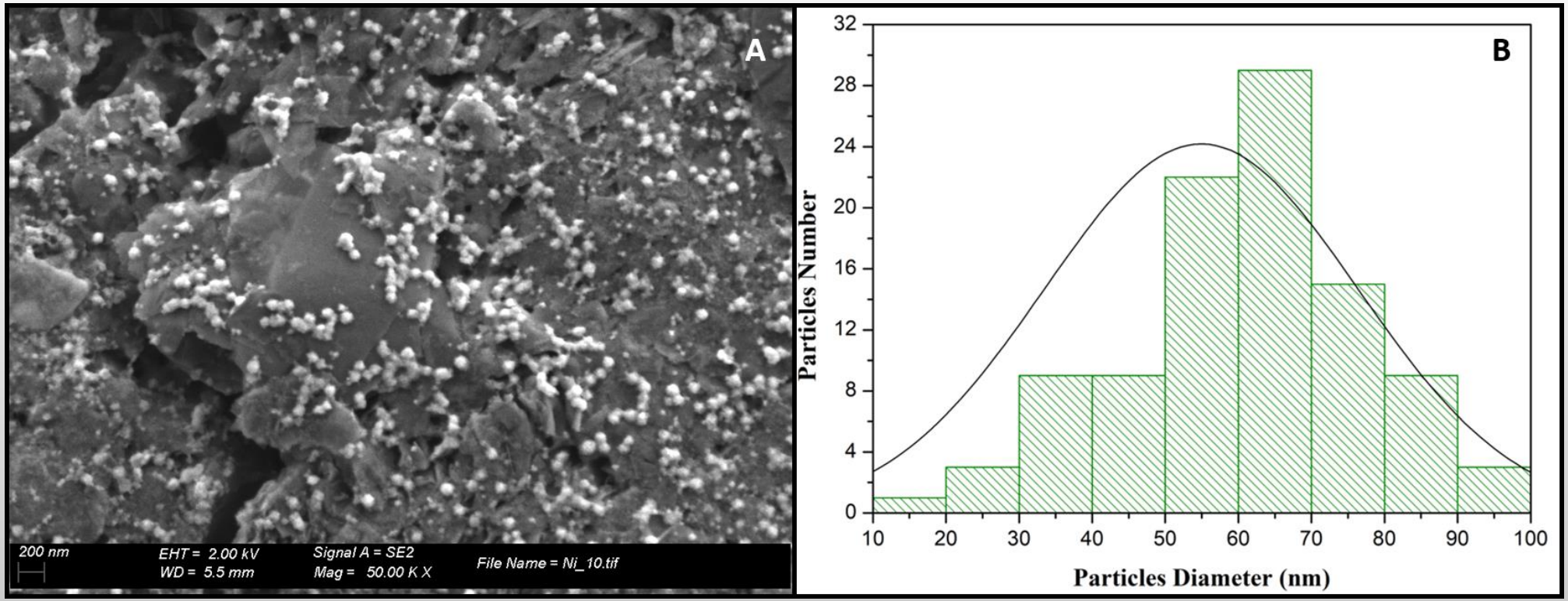
Method

- Formation of **graphite/epoxy** substrates;
- **Graphene** electrodeposition;
- **Nickel hexacyanoferrate** electrodeposition**;**
- **NiOOH** nanoparticles formation: NiHCF film degradation in basic medium**;**
- **Electrode application.**



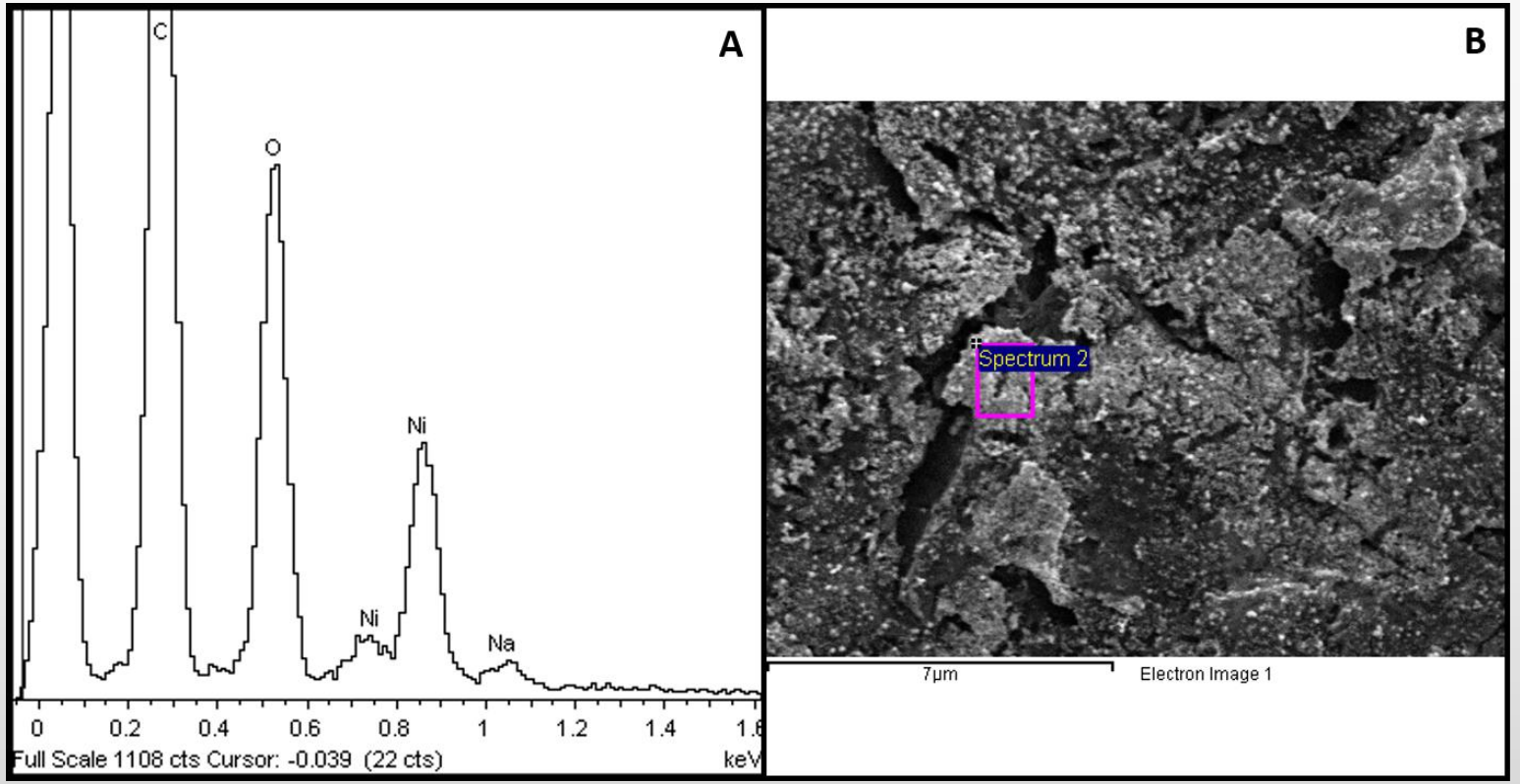
Characterization

- The average size of the NiOOH **nanoparticles** was **61 ± 16 nm**.



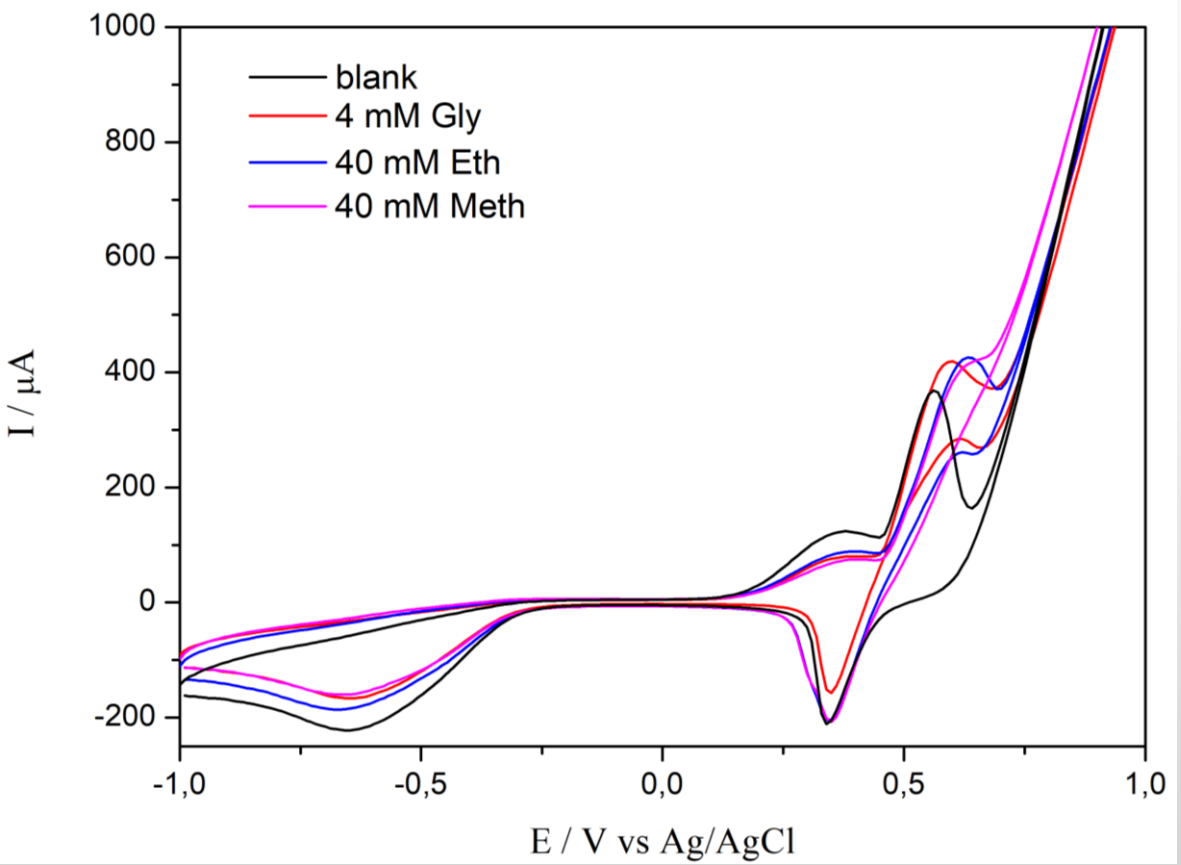
Characterization

- The EDX showed that the surface is composed of **Ni**, **O** and **C**, indicating that the electrosynthesis of nickel oxyhydroxide from nickel hexacyanoferrate (NiHCF) was a success, **not presenting** the elements **Fe** and **K** in the spectrum.



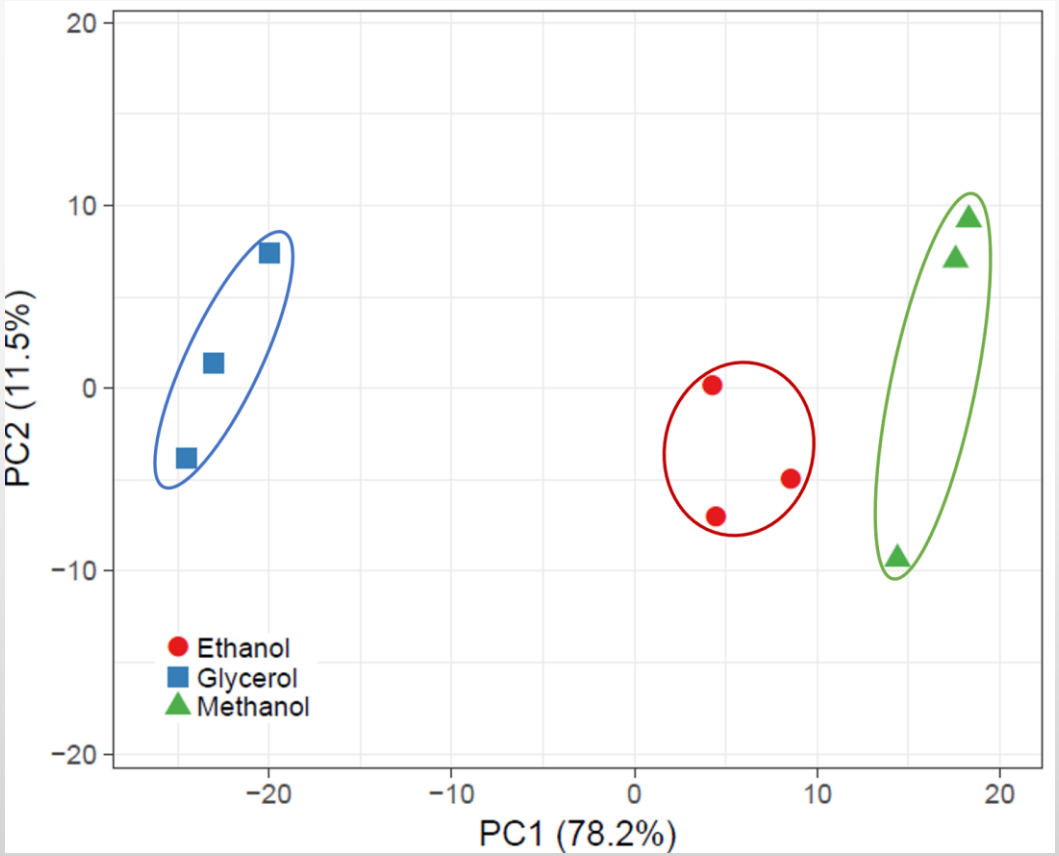
Eletrooxidation of alcohols

- The **LOD** for **methanol, ethanol and glycerol** were **2.16 mM, 2.73 mM and 0.09 mM**, *respectively*, with sensitivity values of **1.32 µA mM^{-1}, 1.80 µA mM^{-1} and 24.60 µA mM^{-1}**, also for methanol, ethanol and glycerol.



Principal Component Analysis

- Multivariate inspection of the data using *Principal Component Analysis* (**performed with use of the ClustVis online tool**) demonstrated the potential ability to discriminate between the different alcohols, whereas the explained variance with the first two components was as high as **89.7%**.



Summary

- A novel EG/rGO/np-NiOOH nanocomposites were prepared in three steps by electrodeposition method;
- EDX confirmed the success of electrosynthesis of nickel oxyhydroxide in reduced graphene oxide. FEG-SEM characterization showed the NiOOH nanoparticles with an average size of 61 ± 16 nm were decorated on the EG/rGO sheets;
- The as-synthesized EG/rGO/NiOOH nanocomposites exhibit excellent electrochemical behavior in the towards oxidation of glycerol, ethanol and methanol.

Acknowledges

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