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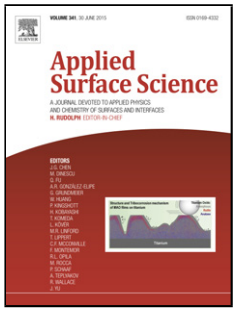

Title: Green Synthesis of Nickel Oxide, Palladium and Palladium Oxide Synthesized via Aspalathus Linearis Natural Extracts: Physical Properties and Mechanism of Formation

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Green Synthesis of Nickel Oxide, Palladium and Palladium Oxide Synthesized via Aspalathus Linearis Natural Extracts: Physical Properties & Mechanism of Formation

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Highlights

- Biosynthesis of nickel oxide, palladium and palladium oxide nanoparticles using Aspalathus Linearis natural extracts.
- Nanoparticles were annealed at 200 and 500 ˚C and characterized by HRTEM, XRD and FTIR.
- Mechanism of reaction is proposed of bioactive orientin as a representative bioactive compound with nickel precursor.
- Electrochemical activity was confirmed by cyclic voltammetry and electrochemical impedance spectroscopy

Abstract

The biosynthesis of PdO and NiO nanoparticles (NPs) via Aspalathus Linearis natural extracts as reducing and capping agent and calcinated at 200 and 500 ˚C. High Resolution Electron Microscope (HRTEM) was used to determine the morphology of PdO NPs exhibited tetragonal and NiO NPs agglomerated quasi spherical shape. The average diameter for PdO NPs is ($f_{particle}$) ~ 22.7 ± 4.3 nm and NiO NPs is ~31.8 ± 5 nm. Selected Area Electron Diffraction (SAED) and X-ray diffraction confirmed both nanoparticles are polycrystalline. Mechanism of reaction is proposed and Infrared spectroscopy confirmed the chemical bonding of the natural extract to the NPs, at 451 and 683 cm^{-1} for Pd and PdO and 481 cm^{-1} NiO NPs. Cyclic voltammetry showed oxidation peak potential for PdO NPs was 0.5 and 0.64 V and reduction peak at 0.68