



## Facile Synthesis and Characterization of Nickel Oxide Nanoparticle Using *Persea americana* Leaf Extract

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### Introduction

The green synthesis of nickel oxide nanoparticles (NiO NPs) using plant extracts has emerged as a sustainable and environmentally friendly approach. This method utilizes biological reducing agents, minimizing the toxic effects associated with conventional chemical synthesis. The use of plant-based extracts provides a cost-effective and eco-friendly alternative for nanoparticle production.

### Materials and methods

In this study, *Persea americana* leaf extract was employed to synthesize NiO NPs, reducing the need for hazardous chemicals. The synthesis process was visually indicated by a colour change from green to black in the nickel chloride hexahydrate ( $\text{NiNO}_3 \cdot 6\text{H}_2\text{O}$ ) solution upon the addition of the extract.

### Results and discussion

UV-visible spectroscopy confirmed nanoparticle formation, displaying an absorption peak at 380 nm. Fourier Transform Infrared Spectroscopy (FTIR) spectra confirmed Ni–O bonding, with peaks detected between 550 and 650  $\text{cm}^{-1}$ . SEM analysis revealed that the synthesized NiO NPs were spherical and highly agglomerated. EDS analysis confirmed the presence of nickel at 7.5 keV and oxygen at 0.5 keV. XRD analysis verified the crystalline nature of the NiO NPs, estimating an average crystallite size of 14.6 nm.

### Conclusion

This study successfully demonstrated the green synthesis of NiO NPs using *Persea americana* leaf extract. The formation of NiO NPs was confirmed through multiple characterization techniques, highlighting their structural, morphological, and elemental properties. This eco-friendly approach provides a promising alternative for the sustainable production of NiO NPs, reducing dependence on toxic chemicals and promoting greener methodologies in nanotechnology. The findings suggest that biosynthesized NiO NPs could be further explored for their potential applications in environmental, biomedical, and catalytic fields.

**Keywords:** NIO nanoparticles, facile synthesis, *Persea americana* leaf