

Accepted Manuscript

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PII: S0030-4026(17)30238-3
DOI: <http://dx.doi.org/doi:10.1016/j.ijleo.2017.02.089>
Reference: IJLEO 58905

To appear in:

Received date: 5-12-2016
Accepted date: 25-2-2017

Please cite this article as: P. Annie Vinosha, Belina Xavier, A. Ashwini, L. Ansel Mely, S. Jerome Das, Tailoring the photo-Fenton activity of Nickel ferrite nanoparticles synthesized by low-temperature coprecipitation technique, Optik - International Journal for Light and Electron Optics <http://dx.doi.org/10.1016/j.ijleo.2017.02.089>

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Tailoring the photo-Fenton activity of Nickel ferrite nanoparticles synthesized by low-temperature coprecipitation technique

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Abstract

Nanosized inverse spinel ferrites are the most captive class of materials, which have significantly amplified the attention of the researchers due to their vital properties. An undemanding and economically viable co-precipitation technique was used to synthesize nickel ferrite (NiFe₂O₄) nanoparticles in order to investigate structural, optical, magnetic and electrical properties. X-Ray diffraction studies confirmed that the synthesized NiFe₂O₄ nanoparticles had a cubic spinel structure. In Fourier Transform Infrared spectra, two primary absorption bands at 561 cm⁻¹ and 453 cm⁻¹ were observed. Particle size was evaluated using High Resolution Transmission Electron Microscopy and found to be in the range 15-18 nm. UV-visible spectral analysis and Photoluminescence reveals the optical property of nickel ferrite nanoparticles. Using Kubelka-Munk plot bandgap is found out to be 2.66 eV and the excitation wavelength shows the recombination of electrons and holes. The retentivity and coercivity were estimated to be 5.4318 emu/g and 1170 G using vibrating sample magnetometer at room temperature (303 K). The photocatalytic application for the synthesized sample was studied for degradation of Methylene blue dye which was monitored using spectrophotometer at regular intervals of time and the mechanism for degradation has been proposed involving •OH radical as an oxidant.

Keywords: NiFe₂O₄; Methylene blue; VSM; Photocatalyst.

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