Green Synthesis and characterization of MgO and Ni doped MgO nanoparticles by Solution Combustion method using Aloe Vera extract

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Abstract

The green synthesis of metal oxide nano particles through plant extract is simple, eco-friendly, cost effective, and less time consuming. Plant extracts helps in reducing metal ions in the synthesis of nano particles. The present study deals with the green synthesis of Ni doped MgO nano particles by solution combustion method using Aloe Veraplant extract as a fuel. The structural and compositional analyses were done by powder X-ray diffraction (XRD), Energy Dispersive X-ray Spectroscopy (EDAX) respectively. XRD analysis revealed the formation of cubical structure of MgO and Ni doped MgO nano particles with average particle size of 31nm. EDAX profile confirmed the signal characteristic of Magnesium and nickel. The functional groups and compounds responsible for nano particle formation and stabilization were studied by Fourier transform infrared (FT-IR) spectroscopy. The absorption patterns were analyzed by UV-visible spectroscopy.

Key words: *Green Synthesis, Aloe Vera extract, Ni doped MgO nanoparticles.*

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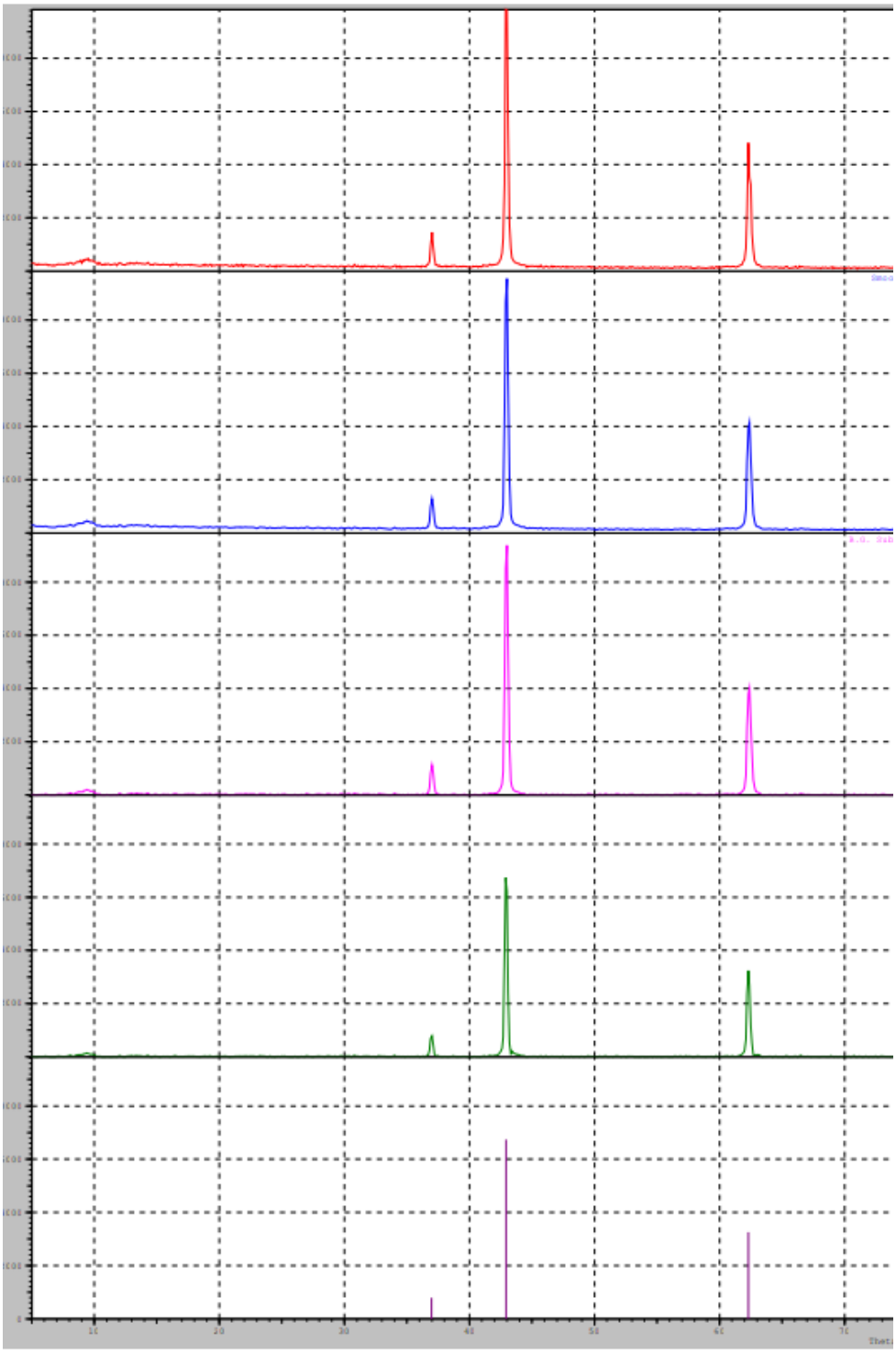
roup: Out-XRD-1269 Data: NiMgO >



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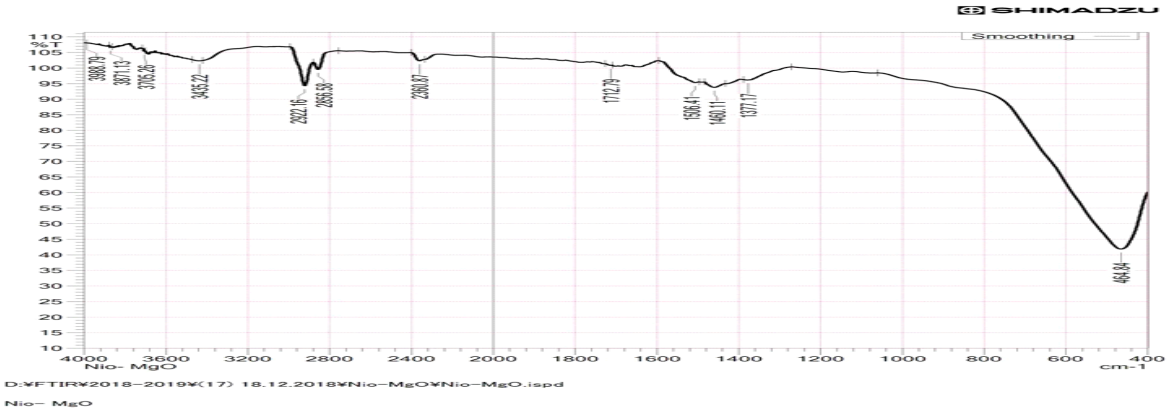
FTIR Analysis

FTIR spectroscopy was used to identify the different functional groups of possible bio molecules present in the plant extract which acts as reducing and capping agents of synthesized Ni doped MgO nanoparticles. Figure shows the FTIR spectra of Ni doped MgO nanoparticles were recorded in the range of 400-4000 cm-1. FTIR results confirm that plant precursors act as stabilizing and reduced

agents.

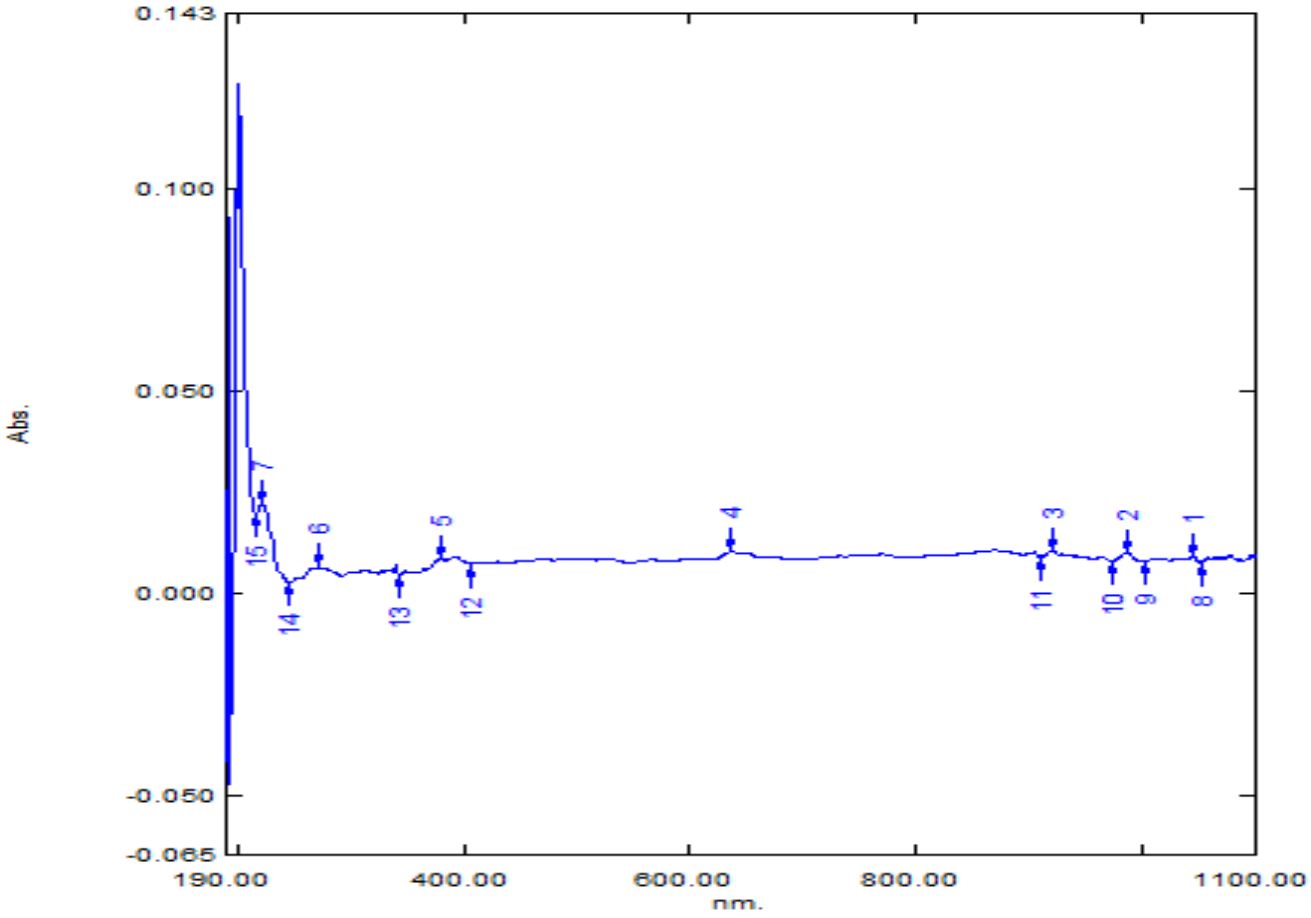


UV-Vis spectroscopy absorption

UV-visible spectrometers can be used to measure the

absorbance of ultra violet or visible light by a sample, either at a single wavelength or perform a scan over a range in the spectrum. The UV region ranges from 190 to 400 nm and the visible region from 400 to 800 nm. The technique can be used both quantitatively and qualitatively. A schematic diagram of a UV-visible spectrometer is shown above.

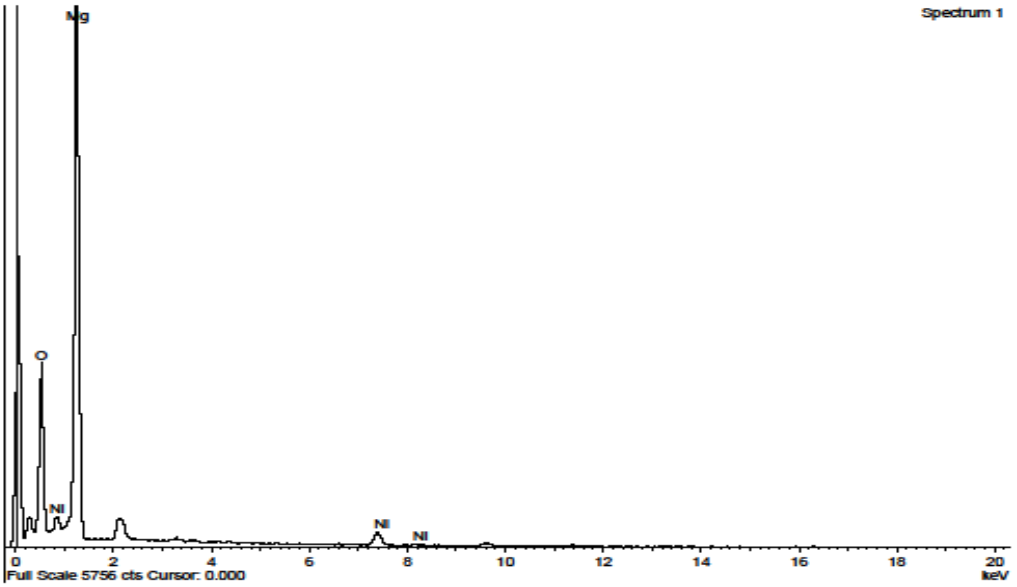
UV-Vis absorption spectrum of Ni doped MgO nanoparticles were analyzed in the wavelength range of 200 to 800 nm (Figure 2). The sharp peak at 220 nm indicates the presence of Ni doped MgO nano particles in the reaction media,which is created by reducing of Mg(NO3)2.



Energy Dispersive X ray Analysis

EDAX spectrum of the prepared Ni doped MgO nano particles was shown in the figure. The EDAX spectrum shows that the product was principally composed of Mg and O, and their respective atomic content is given in the spectrum. Doping of Ni is confirmed by the corresponding peaks of Ni in the spectrum.

Sample: Ni MgO
Type: Default
ID:



Spectrum processing :
Peaks possibly omitted : 2.123, 3.279, 9.601, 11.390 keV

Processing option : All elements analyzed (Normalised)
Number of iterations = 3

Standard :
O SiO2 1-Jun-1999 12:00 AM
Mg MgO 1-Jun-1999 12:00 AM
Ni Ni 1-Jun-1999 12:00 AM

Element	App Conc.	Intensity Corrn.	Weight%	Weight% Sigma	Atomic%
O K	46.91	1.4120	46.04	0.56	56.96
Mg K	32.77	0.8716	52.09	0.56	42.41
Ni K	1.12	0.8357	1.86	0.41	0.63
Totals			100.00		

CONCLUSION

Nanoscience and technology have become the new hot topics in material science. Nanostructured oxide materials have been studied extensively because of their large surface areas, unusual adsorptive properties, surface defects and fast diffusivities. We proposed an ecofriendly method for the synthesis of Ni doped MgO nanoparticles using this plant. The obtained nanoparticles were stable for several weeks and the rate formation of them was extremely rapid and higher or comparable to the rate of Ni doped MgO nanoparticles synthesis by chemical methods or other plant sources. It seems that Aloe Vera was mainly responsible for the reduction and the stabilization of the nanoparticles.The structural and compositional analyses were done by powder X-ray diffraction (XRD), Energy Dispersive X-ray Spectroscopy (EDAX) respectively. XRD analysis revealed the formation of cubical structure of Ni doped MgO nano particles with average particle size of 31nm. EDAX profile confirmed the signal characteristic of Magnesium and nickel. The functional groups and compounds responsible for nano particle formation and stabilization were studied by Fourier transform infrared (FT-IR) spectroscopy. The absorption patterns were analyzed by UV-visible spectroscopy.