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Mini Review

Green Synthesis of Copper and Nickel Nanoparticles

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Abstract

This paper reports about green synthesis of nanoparticles. For the Green synthesis of nanoparticles extracts of *Cucumis* fruit and *Mangifera indica* leaves have been used. These extracts are chosen due to their antioxidant properties. Nanoparticles of Copper (Cu) and Nickel (Ni) are prepared by using above mentioned plant extracts. The nanoparticles are characterized using TEM, IR and UV-visible techniques. The TEM images of Copper nanoparticles describe that different shapes of Cu nanoparticle are obtained. Shape and yield can be controlled by manipulating temperature and pH conditions.

Keywords: Green Synthesis; Nanoparticles; TEM; IR; Antioxidant

Introduction

Nanoparticles refers to the molecule ranging from size 1-100nm [1,2]. Np's synthesize can be completely or partially different from the bulk material with respect to characteristics like size, distribution and morphology [2]. Np's have higher surface to volume ratio. Different types of nanoparticles have been synthesized on the basis of application for example: metallic, nonmetallic, carbon, magnetic.

Metallic Np's are of great interest as they have excellent physical and chemical properties like thermal conductivity [4]. various method is available to synthesize the metal nanoparticle. Green synthesis of nanoparticle is an eco-friendly, cost-effective also it does not involve use of tough metal [3].

Np's has promoted new and improved material for biomedical application [6]. Np's have large size. It easily get bind, adsorb and carry components like protein, drug etc. [5].

Metallic Np's like CuO have potential useful ingas sensor and dye sensitized solar cell. Gold and silver nanoparticles are most common in biomedical application [3]. Nanotechnology is the application of science to control matter at molecular level. It is gaining importance in area such as mechanics, optics, biomedical science, chemical industry, electronic space, drug delivery, nonlinear optical device [7]. Future aspects are getting directed towards use of biosynthesize nanoparticle in natural ecosystem in order to predict their future scope in agriculture [8].

Methods and Materials

Raw materials used in this experiment was obtained from M/S Fluka AG (Bachs, Switzerland) M/S sigma Aldrich chemicals and Co. Inc. (Milwoukee, WI, USA) are corrected. IR spectra was established by using IR affinity, Shimadzu using DRS system.

Experimental

A solution of 0.01m mole $CuSO_4$ was dissolved in 5ml of water. To this solution concentrated *Cucumis* species extract was added. Then this solution was kept in dark for a day with constant stirring. Color change was observed from blue to green. The extract was then observed under UV-Visible spectroscopy, IR spectroscopy, SEM. The result gave a yield of 68% and a melting point of 1085^0C.

Ni nanoparticles synthesis was done in similar way as done previously for Cu nanoparticle. Color change from green to reddish brown was observed. The result gave yield of 72% and a melting point of 1400^0C.

An attempt was made for synthesizing Fe nanoparticles, but it was not possible as the yield which was obtained was very low.

Result and Discussion

UV visible spectroscopy

In case of Cu nanoparticles, the UV-Visible absorption spectrum exhibited an absorption band at 572-582nm.Similar results are obtained in [9] where the absorption spectrum at different time intervals are plotted and in one of the time intervals an absorption band is observed at 580nm.For Ni NPs the UV-Visible spectra show a broad absorption spectral band in the range of 250-320nm which is observed in [10].

IR spectroscopy

The IR spectrum of Cu NPs synthesized in [9] show a broad peak in 3436cm^{-1} to OH group and also emerge signals at 1637cm^{-1} and

Figure 1

1274cm^{-1} which are related to C=C and C-OH stretching vibrations respectively which are similar to the result obtained in the table. The IR spectra of Ni shows a band approximately at 3400cm^{-1} and 1400cm^{-1} which shows the same IR spectra in [10].

Figure 2

SEM

For Ni NPs the UV-Visible spectra show a broad absorption spectral band in the range of 250-320nm which is observed in [10] as well. The IR spectra of Ni shows a band approximately at 3400cm^{-1} and 1400cm^{-1} which shows the same IR spectra in [10]. The SEM result of Ni nanoparticle shows a size of 200nm with approximation. The SEM analysis shows Cu NPs of various sizes.

Figure 3

Conclusion

Chemical methods such as chemical reduction methods are costly and toxic. By using antioxidant from plant extracts, NP's can be synthesized. Manipulation of size and yield can be done by adjusting pH or temperature. Thus, Cu NP and Ni NP are successfully biosynthesized by this eco-friendly, simple and cost-effective method.

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