International Journal of Engineering, Science and Mathematics
Vol. 7 Issue 6, June 2018,
ISSN: 2320-0294 Impact Factor: 6.765
Journal Homepage: http://www.ijesm.co.in, Email: ijesmj@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Study of Copper Nano Particles Using Papaya Leaf Extract

Rajkamal sahu * and Mahesh Kumar *

University Department Of Chemistry , T.M.B.U.

M.M.College, Bhagalpur

Abstract :

In recent years, the development of efficient green chemistry methods for synthesis of metal nanoparticles has become the main focus of researchers. They have investigated in order to find outan eco- friendly technique for production of well-characterised nanoparticles. One of the most considered methods is production of metal nanoparticles using plant parts extracts. Nanoparticles produced by plants are more stable and the rate of synthesis is faster than in the case of microorganisms. Moreover, the nanoparticles are more various in shape and size in comparison with those produced by microorganisms. The present paper deals with the synthesis of copper nanoparticles by a simple procedure using papaya leaf extract as the reducing agent. This procedure offers control over the size of the copper nanoparticles. The nanoparticles produced in this way were characterised by various techniques.

(Key words: Copper nanoparticles, green chemistry,

papaya leaf extract, size of nanoparticles)

Introduction

In recent years, the nanoparticles of transition metals have been synthesised and characterised by various scientists using extracts of various parts of different plants. In such methods, the plant extracts act as reducing agent, which reduce the compounds of transition metals to their nanoparticles. The main advantage of this method is that it is a green chemistry approach for the synthesis of metal nanoparticles because minimum environmental pollution is produced. At the same time, this method is more efficient and the size of the nanoparticles can be controlled more precisely. S. Prathap Chandran and his co- workers synthesised gold triangles and silver nanoparticles using Aloevera plant extract as reducing agent. Saivash Iravani' synthesised the metal nanoparticles using extracts of various parts of plants and studied their biological activity, 5 Shiv Shankar and his co-workers' synthesised and characterised the nanoparticles of gold and silver using Neem leaf broth and investigated their biological activity. The widespread practical application of metal nanoparticles (particles less than nm) is attributable to a number of their unique properties. Various plant

International Journal of Engineering, Science and Mathematics
Vol. 7 Issue 6, June 2018,
ISSN: 2320-0294 Impact Factor: 6.765
Journal Homepage: http://www.ijesm.co.in, Email: ijesmj@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

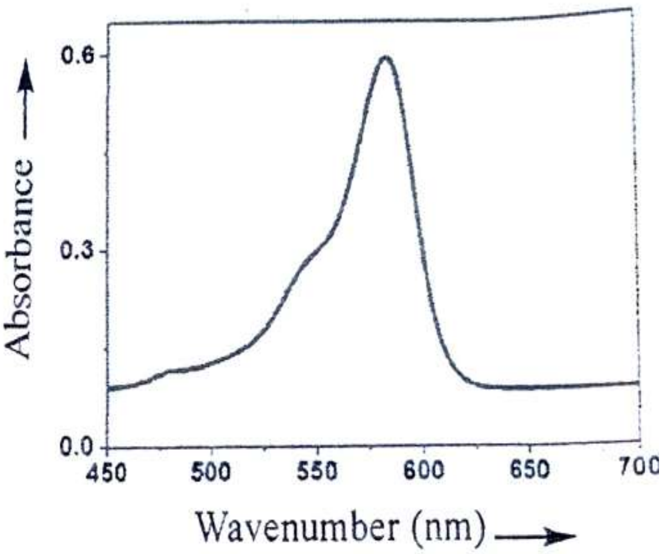
metabolites. including terpenoids, polyphenols, sugars. alkaloids, phenolic acids, and proteins, play an imporantant role in the bioreduction of metal ions. yieldina nanoparticles.

The reduction process of metal ions with the formation of nanoparticles is affected by a large number of factors, besides the nature of a plant extract containing active biomolecules in different combinations and concentrations the effect of which are described above these include reaction mixture PH incubation temperature, reaction , concentration and electrochemical potential of a metalon. Our present work synthesis characterised copper nanoparticles by using papaya leaf extract.

Broth concen-tration	Synthesis temperature (°C)	Average size of copper nanoparticles (nm)
5%	30	109
10	30	105
15	30	101
5%	60	85
10	60	80
15	60	77
5%	90	60
10	90	56
15	90	50

1.Materials And Methods

$CuSO_4.5H_2O$ with 99.5% purity of Merck Company was purchased from local supplier and the papaya leaves were collected from the kitchen garden. The papaya leaves were washed thoroughly, cut into small pieces and dried at room temperature for three days. 30 g of these papaya leaves were transferred to 500 ml sterilized distilled and the mixture was boiled for 15 minutes. The hot solution was allowed to cool at room temperature and then decanted. The papaya leaf broth obtained in this way was stored at 4°C and consumed within 10 days. One litre millimolar solution of $CuSO_4.5H_2O$ was prepared. 170 ml of this was taken in a round bottomed flask fitted with a reflux condenser. This mixture was heated on a water bath. This experiment was carried out using different concentration of papaya leaf broth at different temperatures (30°C to 90°C). The structure and size of the nanoparticles were analysed by scanning electron microscopy (SEM, Hitachi 2500C). The copper concentration were determined using inductively coupled plasma spectrometry (ICP, JY 38plus).



Results and Discussion

The reduction of Cu2+ ions to copper nanoparticles takes place on exposing CuSO,.5H,0 solution to the broth of papaya leaves. This process was indicated by the change in the colour from blue to red and thus it can be followed by UV-VIS spectroscopy. It is observed that the absorption maximum is obtained at 560nm. The intensity of this absorption band increases with the reaction time due to increases in the concentration of copper nanoparticles. We monitored the concentration of copper nanoparticles on quantitative scale determined by ICP and plotting the absorbance of the absorption band at 560 nm against the reaction time:

The following observations were noteworthy:

- The copper nanoparticles were of almost spherical shape.
- The size pf copper nanoparticles varied from 110 nm to 50 nm.
- The particle size of copper nanoparticles decreases with increase in the broth concentration.
- The size of copper nanoparticles also decreases with the increase in the temperature.
- The size of copper nanoparticles decreases with increase in the concentration of CuSO5H.0 in the solution

4. Conclusion:

It is obvious that the synthesis of metal nanoparticles in plant advantages over the traditional methods of nanoparticles is mainly determined by the cost of nanoparticle synthesis. However, in order to the metal salts and reducing agents. In the case compete with nanoparticles obtained through of "green" synthesis, the bulk of the costs will be physical and chemical methods cost-effectively, determined only by the cost of the metal salts, it is necessary to scale these methods of because plant wastes from the food industry can nanoparticle production using plant material and serve as reducing agents. At the same time, it is to develop schemes for keeping expenses in check possible to envision companies involved in the during their synthesis. Continuous methods for food industry and interested in the recycling of the synthesis of nanoparticles have so far been waste to partially pay for nanoparticle production. used only in small-scale production. When using this fact further emphasises the environmental chemical synthesis, the prime cost of advantages of "green" synthesis over traditional methods of nanoparticle production.

References:

1. S. Prathap Chandran, Minakshi Chaudhary, Renu Pasricha, Absar Ahmad and Murali Sastry: Biotechnology Progress. 22 (2) 341 (2006)
2. SaivashIravani Green Chem., 13, 2638 (2011) S. Shiv Shankar. Akhilesh Rai, Absar Ahmad and

3. Murali Sastry, Journal of Colloid and interface Science, 275-2. 2004, 495 (2004)
4. MC. Roco; Curr Opin Biotechnol. 14, 337 (2003)
5. L. Zhang. Gu FX. Chan J.M., Wang AZ Langer R.S., Farc khzad O.C. Clin Pharmacol Ther 83, 761 (2008)
6. M.C. Daniel, Astruo D. Chem. Rex: 104293 (2004)
7. TS. Wong, U. Schwaneberg;Curr. Opin Biotechnol. 14:590 (2003)
    A. I Love, V V. Makarov, IV. Yarinsky. N.O. Kalinina M. E. Taliansky, Virology. 449 :133 (2014)
8. L Sintubin. W Verstraete, N. Boon: Bio-echnology and Bioengineering, 109,2422 (2012)
9. M. Rai. A Yadav, IET Nanobiotechnol. 7(3).117, (2013)
10. S. Saravanan. BN Sath, U. Mony. M. Koskutty. S.V. Nair, D. Menon : ACS. Appl. Marc Interfaces. 4(1).251 (2012)