

Green Synthesis of Silver Nano Particle Using Hibiscus Rosa Sinensis

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Abstract: Green synthesis of silver nanoparticles by the help of green plants is a very cost effective, safe, non-toxic, eco-friendly route of synthesis which can be used for the manufacture at a large scale. The formation of the nanoparticle is identified by the colour change occurred in the solution of silver nitrate after the addition of plant extract. This colour change is due to the property of quantum confinement which is a size dependent property of nanoparticles which affects the optical property of the nanoparticles. The occurrence of the peak at 451 nm is due to the phenomenon of Surface Plasmon Resonance, which is due to the excitation of the surface plasmons present on the outer surface of the silver nanoparticles due to the applied electromagnetic field. The UV absorption peak at 451nm clearly indicates the formation of AgNPs. The absorption for the particular wavelength was 0.331. SEM studies were helpful at describing their morphology and distribution.

Keywords: Green Synthesis, Silver Nano particles, Hibiscus Rosa Sinensis

I. Introduction

Biological synthesis of nanoparticle is a challenging concept which is very well known as green synthesis. Among the different biological agents, plants provide safe and beneficial way to the synthesis of metallic nanoparticle as it is easily available, so there are possibilities for large scale production. In recent years, metallic nano particles have great attention because of modification of properties perceived due to size effects, distribution and morphology (Elizondo et al 2011). Silver nano particles have particular interest due to its unique properties such as high conductivity, chemical stability, catalytic and antibacterial.

Hibiscus is an evergreen herbaceous plant (Fig.1). It has ornamental, large, dark-red flower. Hibiscus flowers, roots and leaves are anodyne and emmenagogue. They regulate menstruation and stimulate blood circulation. Flower extract has been traditionally used for liver disorders, high blood pressure and as an aphrodisiac. Young leaves and flowers are used in case of headache. Decoction of leaves, roots and fruits are helpful in treatments of arthritis, boils and cough, and fruit is used externally in case of sprain, wounds and ulcers. Hibiscus tea is rich in Vitamin C. Hibiscus rosa sinensis is opted for the synthesis of silver nano particle because of the presence of phytochemicals which provide natural capping and reducing agent (Yeppella et al. 2011)



Fig.1. Hibiscus Rosa Sinensis

The aim of this work is to use *Hibiscus rosa sinensis* leaves extract as a low cost and eco friendly approach to green synthesis of silver nanoparticles. The silver nano particle have been characterised by UV Visible spectrometry and SEM.

II. Materials And Methods

2.1. Materials

Silver Nitrate (AgNO_3 , 99% purity, Merck Products), hibiscus leaves collected from Kerala

2.2. Preparation of the plant extract

The leaves of *Hibiscus rosa sinensis* plant were collected from the local garden and then washed thoroughly with tap water to remove the dust and dirt particles. The leaves are then dried under shade for about four days and finely powdered. About 2 grams of the powder was taken and mixed with distilled water. The aqueous leaf extract was taken and then filtered using wattman filter paper to obtain pure hibiscus leaves extract with pale green colour to be used as reducing and capping agents in AgNP synthesis. .

2.3. Preparation of Silver Nitrate Solution

0.125g of Silver nitrate was added into 100ml of distilled water and stirred continuously for 1-2min to get Silver Nitrate solution.

2.4. Silver nano particle synthesis

The best volume of plant extract were added to the best molarity of AgNO_3 solution at room temperature and stirred continuously for ten minutes using Magnetic Stirrer. Slow reduction takes place and kept for 24 hours to obtain the colour change. After 24 hours pale green colour changes to red colour, which indicate the formation of silver nano particle. The Hibiscus leaves extract and AgNO_3 solution mixture was then characterised using UV and SEM.

III. Analysis Method

3.1 UV Visible absorption

Silver nano particles were synthesized by reducing silver metal ions solution with Hibiscus leaf extract were initially characterized using UV-Visible Spectrophotometer (Shimadzu BL).

3.2 Scanning Electron Microscope(SEM)

Particle size and its distribution were assessed with Scanning Electron Microscope. Electron interacts with the electrons in the sample, producing various signals that can be detected and that contain information about surface topography and composition of the samples.

IV. Result And Discussion

The present study involves the green synthesis of silver nanoparticles using widely available plant, *Hibiscus rosa sinensis*, as its reducing agent. While there has been numerous methods to synthesize nano particles like Chemical synthesis, Microwave synthesis, gas phase methods and sol-gel processing in which most of them are expensive and hazardous. Plant extract provide better platform for nanoparticles synthesis as they are free from toxic chemicals.

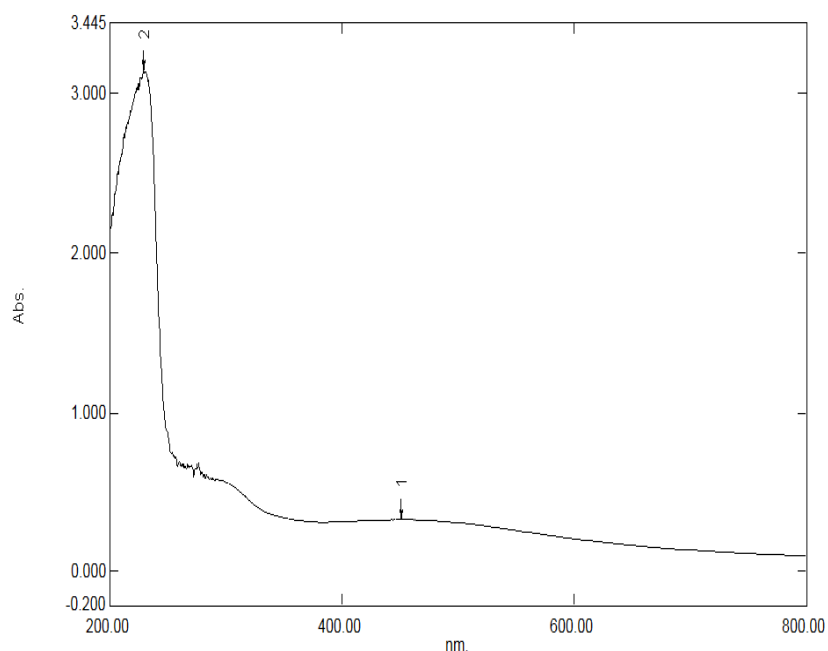
4.1. UV Visible spectroscopy

It has been widely used as an important tool to detect the presence of nanoparticles using green synthesis and the stability of metal nanoparticle in aqueous solution. In particular, absorbance in the range of 420 to 500nm has been used as an indicator to confirm the reduction of Ag^+ to metallic Ag. Fig. (2) shows UV Visible spectra of Hibiscus- Silver nitrate extract. In this study, the absorbance peak of Silver Nano Particle occurs at 451nm which is a narrow peak with an increase in absorbance due to increase in number of nano particles formed as a result of reduction of silver ions present in the aqueous solution.

Spectrum Peak Pick Report

02/26/2015 05:03:23 PM

Data Set: sample 1 23.2.15.spc - RawData



Measurement Properties
 Wavelength Range (nm.): 200.00 to 800.00
 Scan Speed: Medium
 Sampling Interval: 0.5
 Auto Sampling Interval: Disabled
 Scan Mode: Single

No.	P/V	Wavelength	Abs.	Description
1	●	451.00	0.331	
2	●	228.50	3.142	

Instrument Properties
 Instrument Type: UV-2400PC Series
 Measuring Mode: Absorbance
 Slit Width: 1.0 nm
 Light Source Change Wavelength: 360.0 nm
 S/R Exchange: Normal

Attachment Properties
 Attachment: None

Sample Preparation Properties
 Weight:
 Volume:
 Dilution:
 Path Length:
 Additional Information:

Fig.2 UV spectrum of Hibiscus Silver Nitrate Extract

4.2. Scanning Electron Microscopy

SEM analysis was used to determine the structure of reaction product that were formed. In this study the SEM image (Fig. 3 and Fig. 4) has showed individual silver particles as well as particle agglomeration. This indicates, the particle size is irregular and to some extent spherical

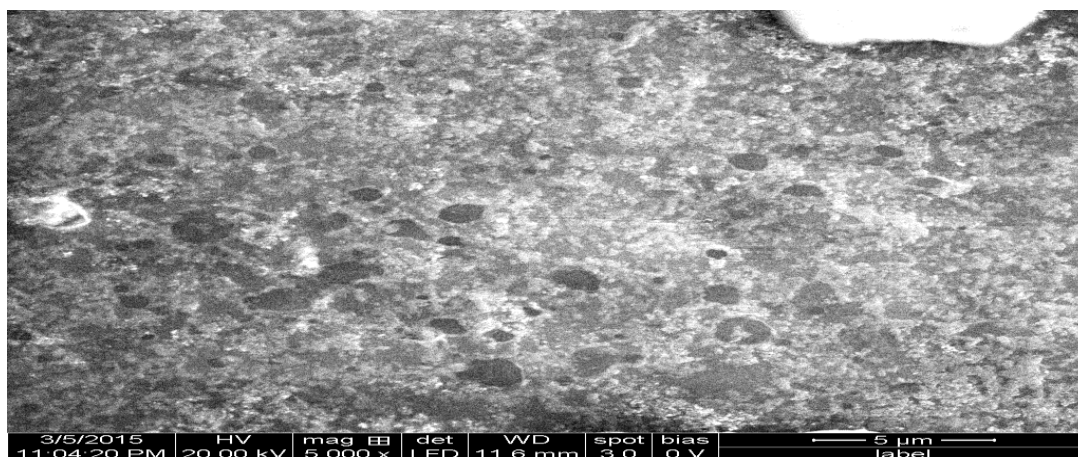


Fig. 3 SEM of Hibiscus Silver Nitrate Extract

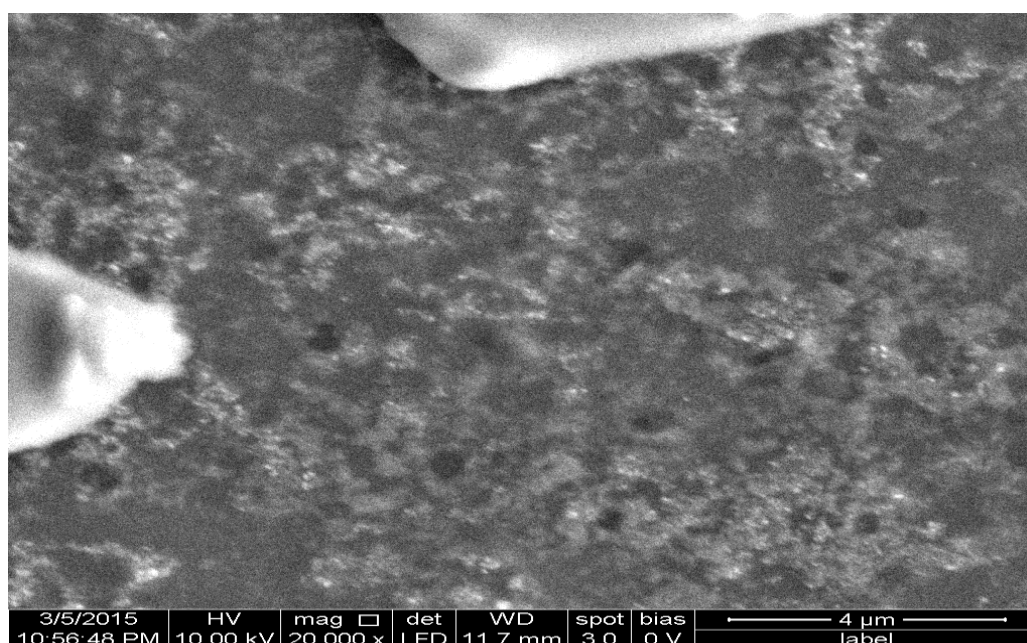


Fig. 4 SEM of Hibiscus Silver Nitrate Extract

V. Conclusion

A simple green synthesis of stable silver nano particle using Hibiscus rosa sinensis at room temperature was reported in this study. The synthesis was found to be efficient in terms of reaction time as well as stability of synthesised nano particles which excluded chemical agents. The green synthesis of silver nano particle methods provides simple environmental ecofriendly and cost effective route for the synthesis of nano particle. The formation of nanoparticle was identified by the change of colour of Hibiscus leaf extract and characterized by UV Visible spectroscopy.

Reference

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