P-ISSN 2349–8528
E-ISSN 2321–4902
JCS 2014; 2(4): 43-45

Received: 30-10-2014
Accepted: 04-11-2014

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Synthesis and characterisation of some silver nanoparticles using reducing agents obtained from fruit extract.

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Abstract
The bio mimetic approach was carried out during synthesis of silver nanoparticles. Aqueous extracts of orange were used as reducing and stabilizing agent for the synthesis of AgNp using bio reduction method. The condition of formation of AgNp was established by varying concentration and p^H of the mixture. The characteristics were studied by using UV-Visible, X-RD and SEM technique.

Keywords: Green synthesis of Silver nanoparticles by using orange extract.

1. Introduction
Green chemistry enhanced the efficiency and reduced the toxicity, whereas Nanoscience reduced the size as well as enhanced the properties. If we combine green chemistry and nanoscience, which has greater applicability in the recent era[1]. Large verities of nanoparticles are expected to be in the market for commercial use in near future. Researchers have interest to use green process having 100% natural integrants in the expand use of nanoparticle in the medical field [2]. The attention is concentrated to synthesize the silver nanoparticles by using bio mimetic path due to their potential in antimicrobial [3], antibacterial [4] activities and DNA sequencing [5-6].
Many procedures were being used to synthesize silver nano particle such as chemical reduction, photo reduction, etc. Most of these methods involve the use of toxic hazardous chemicals which may gain environmental and biological risks in the application part. Henceforth synthesis of noble metal nanoparticles by bio reduction have been widely accepted

2. Experimental
2.1 Material and Methods
The fruits were washed and cleaned with warm water and then deionised water time to time to take its juice with the help of fruit juicer. The container was filtered to replace the fiber and collected in an Erlenmeyer flask. 100 gm of orange was taken to take the juice separately in 3.33:1 proportion with deionised water maintaining its pH 3-7. The fruit extract was centrifuged 8000 rpm for 30 minutes and stored in the dark around 7-10 ^{0}C which can be used as reducing and capping agent within a week.

2.2 Chemicals
The chemicals which were used of highest purity purchased from SRL, India. Three different concentrations of $AgNO_3$ $2X10^{-2}$M, $3X10^{-2}$M, $3.5X10^{-2}$M solution were prepared and stored in different container for synthesis of AgNP.

2.3 Synthesis of Ag NP
70 ml of 20 millimole of $AgNO_3$ was added to 30 ml of orange extract, 80 ml of 30 millimole of $AgNO_3$ with 20 ml orange extract, 75 ml of 35 millimole of $AgNO_3$ with 25 ml of orange extract were taken in three different flasks and fixed it in a rotatory shaker for 3 hours. Concentration and pH of the reducing agent and capping agent plays a vital role in the conversion of silver ion to silver nanoparticles. Then the mixture was incubated for 1 or 2 days, the complete reduction was confirmed by observing the colour change from light orange to yellowish brown and getting maximum absorbance using UV-Visible spectrophotometry.

For all the $AgNO_3$ concentration samples changed their visual appearance shortly after the addition of fruit extract, indicating reduction took place in three different flasks.

2.4 Instrument
After complete reduction the nanoparticle sample was centrifuged at 12000 rpm for 15 minutes, then heat and dried used for characterization by X-Rd, SEM and EDX analysis.

3. Result Discussion
The bio reduction of silver nitrate to silver nanoparticles confirmed by observing the color change after 1 to 2 days. Different concentrations of $AgNO_3$ solution after addiction with fruit extract gives yellowish brown color in the respective beaker. The yellowish brown Ag nanoparticles show maximum absorbance 425 and 445 nm, which was carried by Schmadzn-1601 UV-Visible spectrophotometer which is shown in Figure-1.

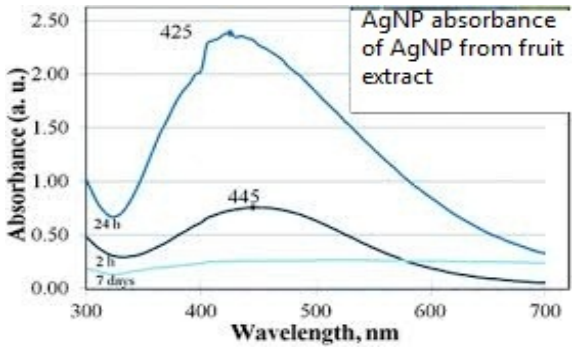

Fig 1: (This shows the reduction is completed within 48 hours)

X-RD analysis [9] confirms the presence of nanoparticles in the crystal form. Intensities were recorded in between 40 to 60 ^{0} at 2theta angles. Fig-2 shows the characteristic spectrum of X-rays emitted from a Mo at 35 kV. The diffraction peaks for well crystallized materials were very sharp and some extent broad. Crystal possess FCC, Hexagonal some noise and peak broadening were observed probably due to the presence of various crystalline biological macromolecules in the orange extract.

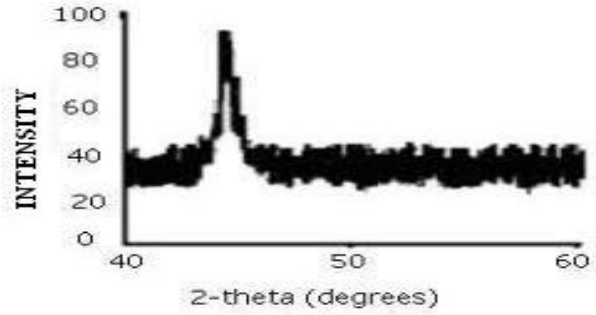

Fig 2: Shows the characteristic spectrum of X-rays emitted from a Mo at 35 kV

The pure dried AgNP were mounted on specimen stubs with double sided taps, coated with gold in a sputter coater. The crystallographic information and composition with size was analyzed by SEM [8] showed the diameter around 39-82 nm. The electron spot and cathode ray tube spot are scanned across the specimen and the tube surface, respectively giving rise to an image of the topography of the surface of the sample which is shown in the fig. Below. EDX (Energy dispersive microanalysis) shows the nanoparticles, which were prepared by bio reduction method peaks around 3.40Kev relates to binding energy no peaks were found when impurities were detached.

Conclusion: In recent era green synthesis of nanoparticles encouraged by the researchers to overcome the toxic effect carried by the chemicals. In the biological application of nanoparticles should be least toxic, easily adsorbed by biomolecules. So due to its huge potential in medicines these types of synthesis and characterization plays a key factor.

Acknowledgment:-I convey my sincere thanks to S. Bal Kumar, Director of National Centre for Nanoscience and nanotechnology Guindy campus, Chennai for the instrumental work.

Table 1: Study of X-RD for sample AgNP from orange extract

2 θ	Relative Intensity	Comments
40	35	noisy
42	37	noisy
44	40	-
45	90	Broad line
45.02	93	Very broad line
48.65	37	noisy
55	36	-
57.52	35	-
60	40	noisy

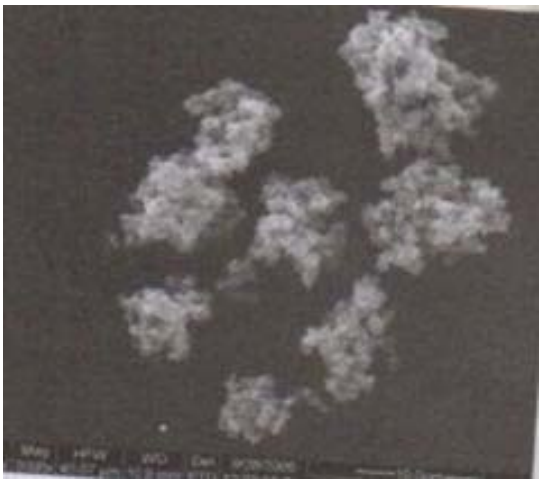

Fig 3: (A) Agglomerated –AgNP from orange extract after bio reduction process.

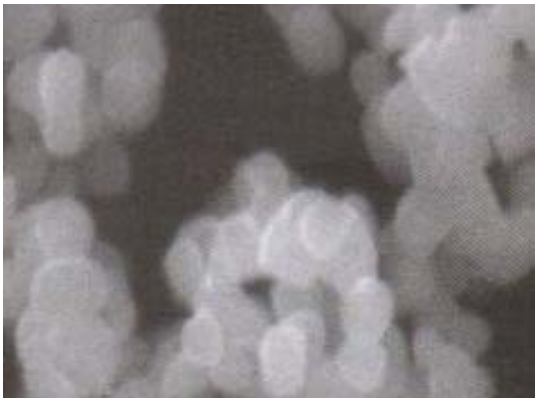

Fig 3: (B) Separated crystallites of AgNP.

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