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Synthesis of Gold Nanoparticles from Natural Honey

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Abstract:-The synthesis of nanoparticles has developed over recent past years. The biosynthesis of nanoparticles from using plants, microorganism, macro organism and some biological methods. The synthesis of gold nanoparticles by green synthesis method using natural honey. The natural honey is an eco-friendly. It has a both reducing and stabilizing and it has no toxic substance. The honey has a rich nutrition value and anti-bacterial, anti-fungal activity. The natural honey and $HAuCl_4$ (Chloroauric acid) dilute with water and react to produce gold nanoparticles at room temperature in 3hours. Honey is reducing capacity, so it reduced to indicate purple color indicates the presence of gold nanoparticles. It's characterized by UV-Visible spectrum, TEM, FTIR.

Keywords: -Natural Honey, Gold Nanoparticles, TEM, FTIR, EDX.

I. INTRODUCTION

Nanoparticles is a promising commodities in many fields in nanoscience and nanoparticles has a derized shape and size[1-3].Nanoparticles considered important area of research in drug delivery, tissue/tumor, biomedical science, photothermal therapy,immuo chromatographic technique, optical device and chemical industries[4-8].The synthesis of nanoparticles by physical and chemical method induced hazardous to human health and environment. In this method top-down and bottom-up process are approached [9-13]

The physical and chemical method requires toxic and non-biodegradable [14]. Also the synthesis of nanoparticles by using bacteria, yeast, enzymes, viruses, fungi and plants [15-19].The green synthesize of nanoparticles is eco-friendly. It has no-toxic compound and non-harzous to health [20]

The honey is sweeter and world healthiest food and it contain fructose, glucose, functional group of amino acids, vitamins, minerals, trace amounts of flavonoids and antioxidants helps to built-up body [13, 21-24].Natural honey has anti-bacterial, anti-fungal activity, reducing and protecting agent [25].

II. MATERIALS AND METHODS

A. Collection of Materials

Honey was collected from Kerala (India), $HAuCl_4.3H_2O$ from Mumbai.

B. Synthesis of AuNP's

The synthesis of gold nanoparticles from natural honey. The honey is diluted to water, 20g of honey is diluted with 70ml of distilled water. Different volume of honey (15, 20, 25, and 30) ml is used for synthesis nanoparticles. The 50mg of $HAuCL_4$ is dissolved in 120ml distilled water. The 10ml of honey is added to 30ml of $HAuCL_4$.The varied concentration of honey is taken as 15(s_1), 20(s_2), 25(s_3), 30(s_4). The honey is a reducing agent to give purple color at room temperature within 3hrs [26and 27].

C. Characterization of Nanoparticles

After synthesis of gold nanoparticles from natural honey. Then the sample was characterized by using UV-Visible spectrum to absorption the peak of gold nanoparticles. The highest peak of (s_4) is centrifuged at 10,000rpm for 30min and collect the pellet, analysis the sample in TEM gives the high resolution image and identified size and shape of AuNPs. The energy dispersive X-ray (EDX) at acceleration voltage of 120KV. FTIR is use to identify which biomolecules produce the gold nanoparticles. To detect Capping of nanoparticles and stabilization of gold nanoparticles. TEM, EDX, FTIR analysis the pellet were submitted to PSG Tech, Nanotechnology department, Coimbatore.

III. RESULTS AND DISCUSSION

A. Synthesis of Gold Nanoparticles

The honey contain fructose, monosaccharides is a primary reducing Agent. The vitamin c is reducing agent next to sugar molecules. Further the honey has a glucose is react with water and oxygen produce H_2O_2 and gluconic acid. The small amount of H_2O_2 act as mild antiseptic and its reduced organism activity. The glucose convert to gluconic acid to

reduce the fructose in honey and it responsible for reduction. This is same for sucrose and protein, enzyme to reducing the honey [13, 26, and 28]. Excess honey reduce the aqueous $HAuCL_4$ it act as capping agent and gives shape to nanoparticles. Among the 4 samples 30ml shows the best result.

B. UV-Visible Spectrum

Spectrum range at 550nm absorbance the peak of nanoparticles. In this study at the concentration of 15ml-169.45, 20ml-244.42, 25ml-287.65, 30ml-327.52 the value drawn as graph (1). The synthesis gold increases in (S_4).

C. TEM

TEM image to conform the size and morphology of gold nanoparticles. Gold (s_4) consist the spherical shape it average size ± 50nm (Fig. 1). The excess honey to reduce the aqueous $HAuCi_4$ it acting as capping agent shaped spherical nanoparticles. Gold [S_4] consists also triangular shape is ±20nm (Fig: 2) reduction of $HAuCL_4$ capping strongly to shape Nano triangular [26 and 27].

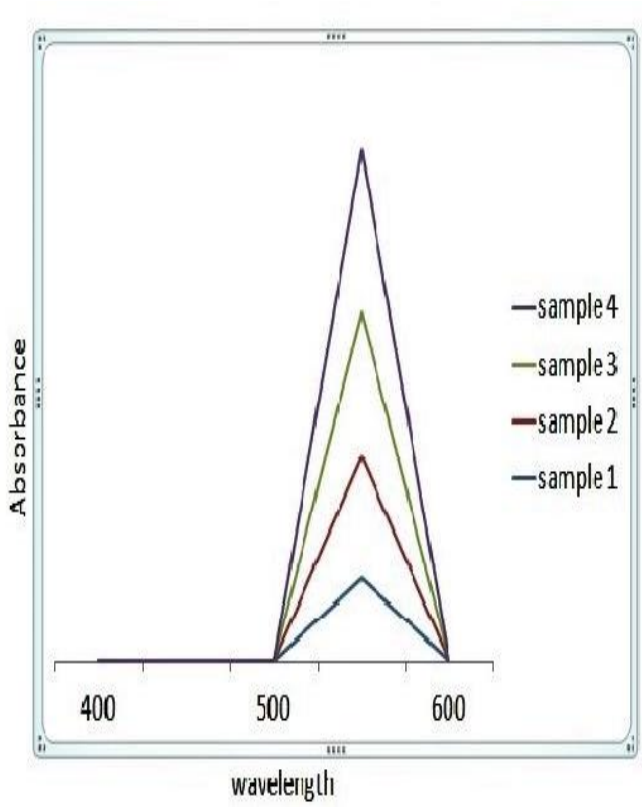

Fig.1: UV-Visible Spectrum

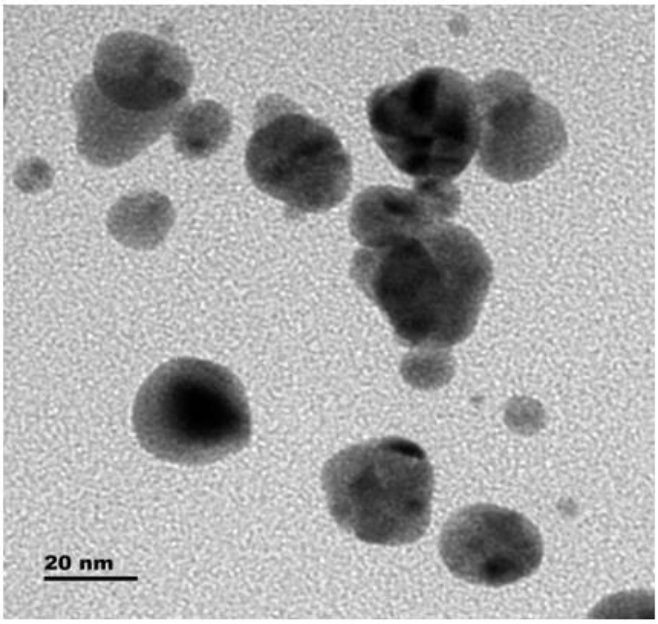

Fig.2: (s_4) AuNPs Spherical Shap

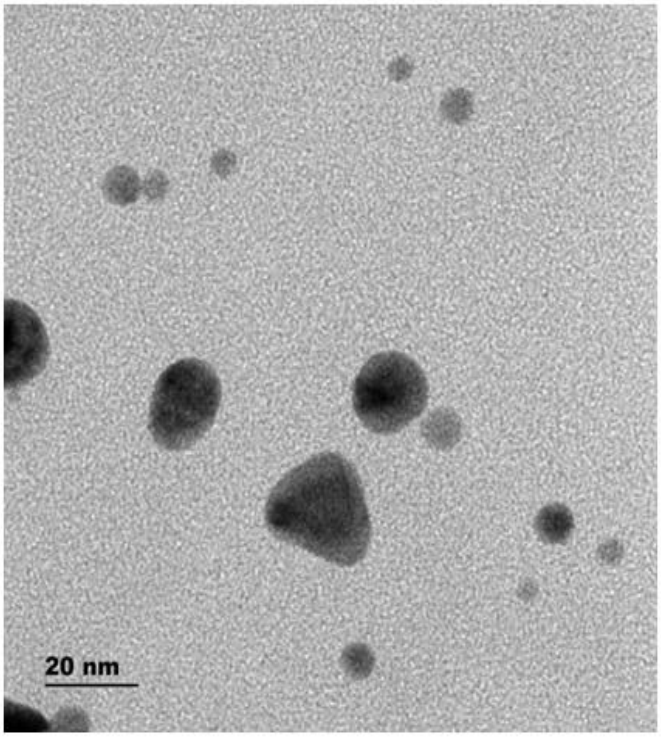

Fig. 3: (s_4) AuNPs Triangular Shapes

D. EDX

The energy dispersive X-ray (EDX) pattern recorded gold nanoparticles. The analysis of sample (S_4) indicates of gold nanoparticles signals confirms the encapsulated matrix of honey. The peaks of carbon, oxygen, detected reducing of honey (Fig: 4)

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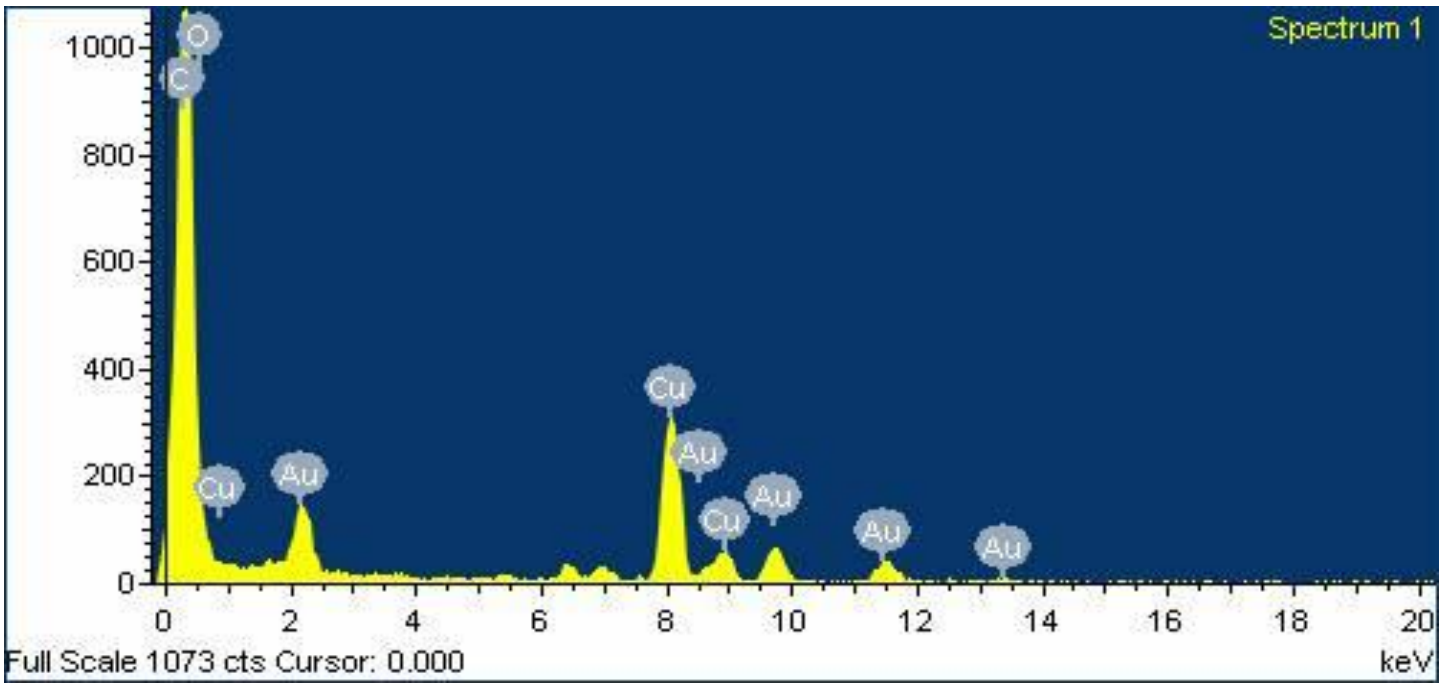

Fig.4: (s_4) AuNPs Matrix of Honey

E. FTIR

FTIR detected the capping and stabilization of AuNPs. The sample (s_4) absorptions intense are 1640, 1040 cm^1. The IR band at 1640 has amide I and II bands of protein are occur [29].The 1040 band presence of C=0 indicates the-COOH group bound on gold nano particles [30]. IR bands are indicates possible compound protein and –COOH group based on gold nano particle [26].

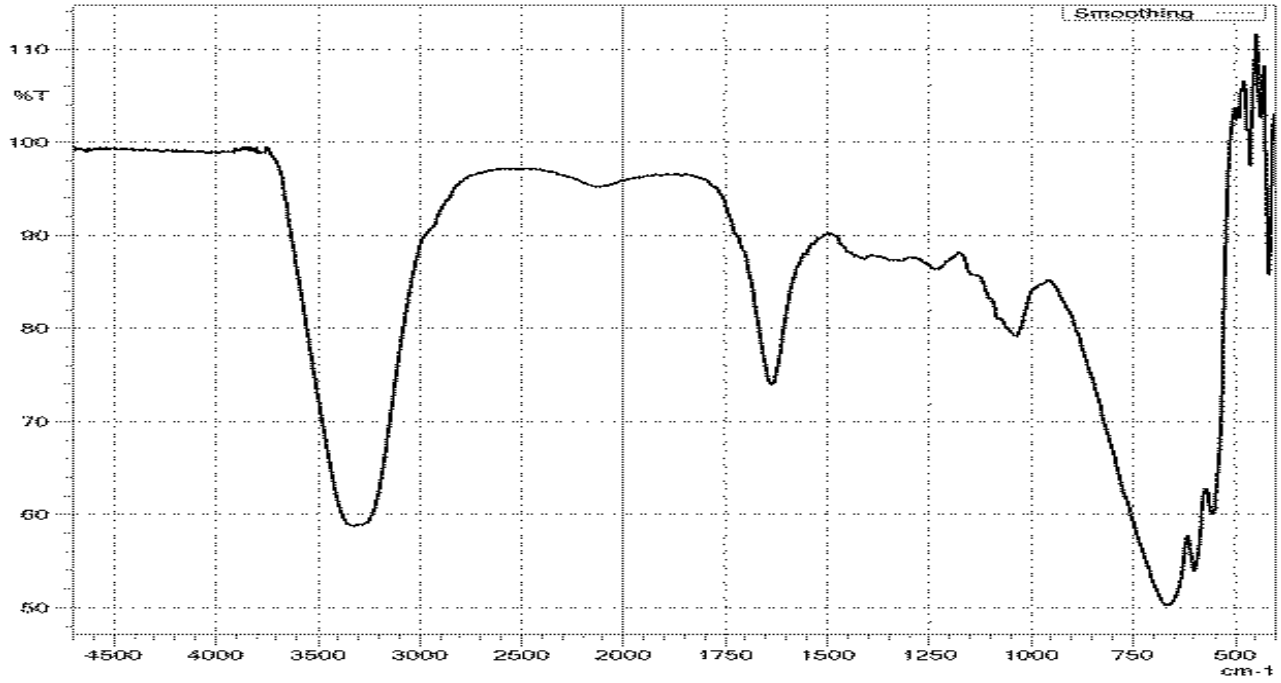

Fig.5: FTIR Gold Nanoparticles

IV. CONCLUSION

The natural honey used to synthesis gold nanoparticles is a green synthesis method. The honey gold nanoparticles are an eco-friendly, non-harzous to health and environment. It has a rich nutrient food. Honey mediated gold nanoparticles applicable in many field.

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