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ABSTRACT

In the present study silver nanoparticles were prepared by using chemical synthesis. Silver nanocolloid has been prepared chemically by the reduction of silver nitrate by using tri sodium citrate.

KEYWORDS : Silver nano particles, Reducing agent ..

INTRODUCTION:

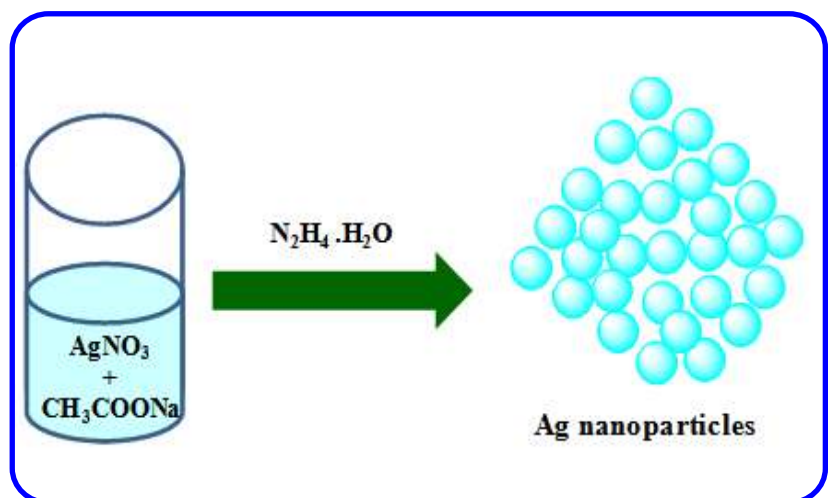
Nanotechnology the " buzzword " today has started appearing in media frequently. As such everybody is curious to know what lies inside this science & associated technology. That is the motivation for this article , Nano(10⁻⁹) a prefix derived from the Greek word nanos, meaning a billionth part. Thus 10⁻⁹ nanometer a

meter.

Properties of different materials depend on the size of particles & arrangement of constituent atom or molecules.

Nano materials are particles or object that are smaller than 100 nm in length.

As the particle size decrease the relative number of atoms on surface increases. There is an increase in the ratio of surface area to volume. High



surface area is an important factor in catalysis & electrodes which leads to improvement in technologies of fuel cells & batteries. As particle size reaches the nano range (1-250 nm) the phenomenon of size quantization becomes operative. This is because the size particle is comparable to De Broglie wavelength of its electron & holes.

Development in nanoscience & technology are all pervasive in different branches of science. Nanotechnology is described as most important technological revolution after industrial revolution.

In the quest for development of materials with novel properties two approaches have been used.

- a) Decrease in particle size to the nano range in order to have materials with desired novel properties : top down approach.
- b) Design novel materials by putting atoms together in an imaginative way or rearranging the atom : bottom up approach.

There is no limit to what we can achieve by the above two methods. The greatest motivation for novel designs at nano level comes from living systems. Consider the following facts.

- a) Human brain is the best & the fastest computer.
- b) The eyes & the connected vision machinery is the most sophisticated camera.
- c) How nature (biological systems) stores information and fabricates structures at the nanoscale?

Different Methods for Synthesis of Nanomaterials:

There are different types of methods for the synthesis of nanoparticles, but from that we use chemical method. Because there are numerous advantages of using chemical methods, which are summarized as follows:

Some Advantages of Chemical Synthesis,
Simple techniques

This method is inexpensive, less instrumentation compared to many physical methods.

In this method low temperature (< 350o C) is required for synthesis.

Materials are obtained in the form of liquid but can be converted into dry powder or films quite easily.

Self assembly or patterning is possible.

Colloidal Route Method:-

Chemical Reactions in which colloidal particles are obtained are carried out in glass reactor of suitable size. Glass reactor usually has provision to introduce some precursors, gases as well as temperature, pH etc. during the reaction. It is usually carried out under inert atmosphere like argon or nitrogen gas so as avoid any uncontrolled oxidation of products. There is also provision made to stir reactants during the reaction by Teflon coated magnetic needle.

Growth of Nanoparticles :-

Chemical synthesis of nanoparticles may appear as complex process, by understanding how nucleation and growth of particles takes place, it is possible to control the various steps and try to achieve.

Synthesis of Metal Nanoparticles By Colloidal Route :-

Colloidal metal nano particles are often synthesized by reduction of some metal salt or acid. For example silver nanoparticles can be obtained by reducing silver nitrate with tri-sodium citrate. Metal silver nanoparticles exhibits golden yellow colour depending upon the particle size. In similar manner gold, palladium, copper and other metal nanoparticles can be synthesized using appropriate precursors, temperature, pH duration of synthesis etc. particle reaction parameters and can be controlled to achieve desired results. It is also possible to synthesize alloy nano particles using appropriate precursors.

Experimental Set up of Colloidal Route Method :-

The silver nitrate and tri-sodium citrate reacted with each other at different temperature, using magnetic stirrer. The clear solution becomes golden yellow, which indicates to formation of silver nanoparticles. It consist of round bottom flask, magnetic needle, magnetic stirrer cum heater.

Round Bottom Flask –

It is three necked round bottom flask one neck is for the thermometer. The middle neck is air tight

so as to avoid any oxidation and in the third neck syringe is placed for addition of reactants drop by drop.

Magnetic Needle –

This needle is used for stir the reactants during the reaction. This needle is coated by using Teflon.

Preparation Of Solution:-

Firstly we have to prepare 0.002 molar of silver nitrate solution and 0.002 molar of tri sodium citrate. For 0.002 molar of silver nitrate we take 0.3397 gram of powder of silver nitrate and dissolve it in 100 ml of distilled water. Then that produces 0.002 molar of silver nitrate solution.

For preparation of 0.02 molar of tri sodium citrate we take 0.516 gram of tri sodium citrate and dissolve it in 100 ml of distilled water then it forms 0.002 molar of tri sodium citrate solution.

Synthesis Procedure:-

- 1) First we take 50 ml of 0.002 molar aqueous silver nitrate solution in round bottom flask.
- 2) At 80°C stir the silver nitrate for 30 minutes.
- 3) After that add 50 ml of 0.02 molar tri sodium citrate drop by drop with the help of syringe.
- 4) Stir the solution for 1 hour at 80°C.
- 5) Then it is observed that clear solution turns into golden yellow indicates the formation of nanoparticles.

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