

# **SYNTHESIS AND CHARACTERIZATION OF METAL NANO PARTICLE FILLED POLYMER NANO COMPOSITES**

## **INTRODUCTION**

Discoveries related to nano materials have led to a true revolution in science and technology. The reason for this is that there is a growing need for polymer nano composites in all the areas of human community, which is due to the wide possibilities of controlling the properties of polymer nano composites by varying not only the polymer matrix but also the nature, dimensions and properties of the nano filler

Silver is a nontoxic, safe inorganic antibacterial agent. Silver nano particle's extremely large surface area permits the coordination of a vast number of ligands. The properties of silver nanoparticles applicable to human treatments are under investigation in laboratory and animal studies, assessing potential efficacy, toxicity, and costs.

## **MATERIALS AND METHODS**

The controllable synthesis of nano crystals with different shapes is very important and challenging. Here we in cooperated the usual solvothermal method with reflux method. All of the chemical reagents used in our experiments were analytical grade .A 40 millilitre ethylene glycol solution of sodium chloride with different concentrations (.2 mM and 20Mm)was vigorously stirred after the addition of 1.776 g of polyvinyl pyrrolidone(PVP).the mixed solution was injected drop by drop using a syringe into 40ml of a magnetically stirred EG solution of silver nitrate(.1 mol) for 5 minute. The solution became milky white at low sodium chloride concentration but cloudy at a high sodium chloride concentration. After wards the solution is heated at moderated temperature. Heating is done by reflux method.

### ***Reflux method***

Here the reaction mixture is placed in a vessel open only at the top. This vessel is connected to a condenser, such that any vapors given off are cooled back to liquid, and fall back into the reaction vessel. The vessel is then heated vigorously for the course of the reaction. The advantage of this technique is that it can be left for a long period of time without the need to add more solvent or fear of the reaction vessel boiling dry as any vapour is immediately condensed in the condenser. In addition, as a given solvent will always boil at a certain temperature, one can be sure that the reaction will proceed at a constant temperature. The constant boiling action also serves to continuously mix the solution.

After 45 minutes of distillation, the solution is cooled to room temperature .finally, the products were washed with acetone and deionised water. A syringe was used to remove supernatants containing redundant EG and PVP,and the samples were retrieved from the bottom of the tubes . The final samples were preserved in deionised water prior to micro structural and spectroscopic characterisation.

The reduction of metal ions was roughly monitored by visual inspection of the solution .The conversion of the colourless reaction mixture to a dark pink colour clearly indicates the formation of silver nanoparticles.

The structural analysis of the sample were carried out using a RIGAKU x ray diffractometer with Cu  $k\alpha$  line. The optical transmission of the sample was taken in the wavelength range of 200 to 1000nm.The measurements are performed using JASCO V 570 ,UV VIS NIR spectrophotometer.And the morphology of the nano particles was analyzed by using transmission electron microscope (Jeol/JEM 2100 )

## **RESULTS AND DISCUSSION**

From the structural characterization it is clear that silver nanoparticles are formed from the followed solvothermal method. The TEM analysis strongly support this conclusion and there are some amount of silver nano wires and bi pyramidal structures within the sample due to the NaCl concentration change .From the optical characterization it is sure that different nano silver structures are there in the sample and it also shows the typical metal optic proprety-surface Plasmon resonance. Photoluminescence study reveals that photoluminescence happens in the range of 420-422nm .This peak is also very close to the peak of PL band of bulk silver.

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