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Editorial

Green Synthesis of Silver nanoparticles

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Introduction

Nanoparticles (NPs) exhibit different physical and chemical properties with respect to its bulk counterpart due to high surface energy resulting from high and large specific surface area, high fraction of surface atoms and a modified electronic structure. In the past few years silver nanoparticles (AgNPs) have gained intensive research interest due to their exceptional physicochemical characteristics which allows them to be suitably used in medical field as antimicrobial agent, household appliances, textile, domestic water purification system, cosmetics and in electronics. In view of the wide range of applications of AgNPs, various chemical and physical methods are used to commercially synthesize these nanoparticles, but continuous use of these methods may cause a great risk to environment as well as for human beings because of the use of toxic and hazardous chemicals and generation of harmful by-products in some instances. This major environmental concern attracts researchers towards the concept of green nanotechnology. Green nanotechnology is the concept which involves the eco-friendly synthesis of Nanoparticles. The green synthesis may involve utilization of microorganisms, enzymes or plant extract for preparation of nanoparticles.

Green synthesis of silver nanoparticles using plant extracts

Green synthesis of silver Nanoparticles using plants is emerging as an eco-friendly alternative, as plant extract mediated biosynthesis of nanoparticles is cost-effective, which provides natural capping agents in the form of proteins. The phytochemicals present in plant extracts are responsible for the immediate reduction of ions and formation of AgNPs. Particularly phenols and alkaloids which could be used as reductant for silver ions and therefore used for formation of AgNPs in the solution of silver nitrate. Initially, the reduction of various complexes with Ag^+ ions leads to the formation of silver atoms Ag(0), which is followed by agglomeration into oligomeric clusters. These clusters eventually lead to the formation of colloidal Ag nanoparticles.

- $Ag\ NO_3$ + Aqueous plant extract → $Ag^+ + NO_3^-$
- Biomolecules of phenols and flavenoids $+Ag^+ + e^- \rightarrow Ag^0 \rightarrow$ AgNPs
- AgNPs+ Proteins in plant extract (capping agent) → Stable AgNPs

This method provides a clean, nontoxic ecofriendly, cost effective and efficient route for the synthesis of AgNPs at room temperature conditions without using any additive. From the point of view of nanotechnology, this is a significant advancement to synthesize silver nanopowder.