Name of the Scholar : Mr. Abhijeet Mishra

Name of the Supervisor : Dr. Meryam Sardar

Name of Department : Department of Biosciences,

Jamia Millia Islamia, New Delhi.

Title of Thesis : Enzyme mediated biosynthesis of silver, gold and magnetic nanoparticles and their characterization

Abstract

The synthesis of nanoparticles is a growing area of research in the field of materials science because they exhibit unique properties, different from those of bulk metals due to their unique size and shape dependent characteristics. We investigate the enzymes (alpha amylase, peroxidase and cellulase) for the biosynthesis of silver and gold nanoparticles. The use of a specific enzyme in the in vitro synthesis of nanoparticles is important because: this would do away with the downstream processing required for the use of these nanoparticles in homogenous catalysis and other applications. The primary challenge in developing nanoparticle based enzymatic devices is to be able to chemically immobilize an enzyme, which will retain its activity or improve its function while being attached to the nanoparticle. We also synthesize iron oxide magnetic nanoparticles by extracellular secretions of baker's yeast. The biosynthesized nanoparticles were found to possess peroxidase enzyme like activity. The temperature optima, pH and kinetic parameters of the nanoparticles were investigated and compared with horseradish peroxidase (HRP). The kinetic parameters indicate that the synthesized nanoparticles can be efficiently used as an artificial peroxidase. The peroxidase like activity of the nanoparticles can be exploited for the detection of H_2O_2 and glucose.

These processes offer a simple and inexpensive method to generate large amounts of stable nanoparticles of different shapes and sizes. The results obtained indicate that the enzyme mediated synthesis could be the leading large-scale production method for nanoparticles in future.