



## PhD Project

### Project Details

#### Project Title

Impact of metallic nanoparticles on the Laccase activities.

#### Project Summary

Laccase is one of the few enzymes that have been the subject of study since the end of the last century. It is one of a small group of enzymes called the large blue copper proteins or blue copper oxidases and has potential ability of oxidation. It belongs to those enzymes, which have innate properties of reactive radical production, and its utilization in many fields had been ignored because of its unavailability in the commercial field. Recently some bacterial laccases have also been characterized from *Azospirillum lipoferum*, *Bacillus subtilis*, *Streptomyces lavendulae*, *S. cyaneus* and *Marinomonas mediterranea* of the last century. The enzyme is a type of copper-containing polyphenol oxidase that was discovered in the exudates of the Japanese lacquer tree *Rhus verniczfera*. The occurrence of laccases in higher plants appears to be far more limited than in fungi. Laccases in plants have been identified in trees, cabbages, turnips, beets, apples, asparagus, potatoes, pears and various other vegetables.

There are diverse sources of laccase producing organisms like bacteria, fungi and plants. Textile, pulp and paper industries discharge a huge quantity of waste in the environment and the disposal of this waste is a big problem. To solve this problem, work has done to discover such an enzyme, which can detoxify these wastes and is not harmful to the environment. Laccases use oxygen and produce water as by product. They can degrade a range of compounds including phenolic and non-phenolic compounds. They also have ability to detoxify a range of environmental pollutants.

Their property to act on a range of substrates and also to detoxify a range of pollutants have made them to be usable for several purposes in many industries including paper, pulp, textile and petrochemical industries. Laccases have been subject of intensive research in the last decades because they have the following properties: broad substrate specificity do not need the addition or synthesis of a low molecular weight cofactor, as their co-substrate - oxygen is usually present in their environment, most laccases are extra-cellular enzymes, making the purification procedures very easy and they generally exhibit a considerable level of stability in the extra-cellular environment.

Nanoparticles accumulation in the environment is increasing day by day. It is observed that nanoparticles in the sludge and soil becoming a new challenge and creating challenges in the bioremediation. So the aim of the study to find out the impact of metallic nanoparticles on the Laccases. The study aims to find out the possible impact on the structure as well as the activities of the enzyme.

### PhD Supervisors

Role	Faculty	Academic Unit in IITD	Email ID
Supervisor 1	Prof Kavya Dashora	CRDT	kdashora@rdat.iitd.ac.in

**Project requirements (Student qualifications, experience required, etc)**

- Research Fellow (1)
- Qualifications and experience as per the IIT Delhi.

**Source of funding (IRD/FITT Project details, if any)**

Institution Fellowship

**Role of Faculty Members involved:**

**Prof Kavya Dashora-** Project design, experimental protocol finalization, nanoparticle synthesis, enzyme extraction, Data analysis and other trouble shooting.

**Prof SK Khare:** Chemical analysis, enzyme extraction and purification aspects of enzymes