



INDIAN INSTITUTE OF TECHNOLOGY BOMBAY POWAI, MUMBAI 400076.

Advertisement No.: IRCC/EXT323/2022

Job Title

Junior Research Fellow

Job Reference Number

50376745

Application End Date

20.01.2023

Type of Employment

Proj. Staff Contract

No. of Position(s)

2

IITB Project Recruitment:

Project title: Particle capture by charged droplets using electrodynamic balance for electro spray air cleaner, funded by DAE-BRNS

About the project: Background of the project:

Increasing air pollution in towns and cities, and threat from the recent pandemic has made air cleaning, by reducing levels of the particulate (virus) matter, an important aspect of every-day life. It is envisaged that like water purifiers, air purifiers would soon become an essential feature of households, industrial setups and hospitals and public spaces.

In this context, the presently available technologies are filter based, water spray based and ionizer based. While filtration has high efficiency and is a time tested technique, it puts premium on air flow rate due to inbuilt filter resistance. In the public domain the hazards associated with replacement is also a matter of concern. Corona discharge ionizers as used in electrostatic precipitators overcome the pressure drop and self cleaning issue, but are generally limited to industrial applications. Domestic unipolar ionizers without airflow tend to contaminate the walls, when integrated with flow, ozone problems might arise. Electro spray technology is the emerging alternative in this genre of mechanisms for particle removal. One would like to develop a hybrid technology embodying stages involving these mechanisms.

The main aim of the project is to develop an electro spray based filter less air purifier prototype. The PhD projects would undertake experimental studies, theoretical and analytical model development, CFD studies and ultimately a prototype development of an air-purifier.

Essential Qualifications & Experience:

BE/BTech in Chemical or Mechanical Engineering

Job Profile:

Position 1: Studies on particle scavenging characteristics by ElectroHydroDynamic (EHD) Sprays and the development of a filterless Aircleaner System

The use of charged droplets to treat pollutants and combustion products has been described in the literature since 1940s. It overcomes the problem of high pressure-drop in filtration and ozone generation in electric based air purification systems. The project aims at both, developing a fundamental understanding of interaction between charged droplets and aerosol particles and based on this learning building a prototype electro-spray based air cleaner.

The project would essentially involve conducting a series of experiments on understanding the fundamentals of droplet-particle interaction, using an in-house levitation device, namely the electrodynamic quadrupole trap. Charged droplets and aerosols interact via hydrodynamic as well as electrostatic interaction. These understandings will be used to develop a scaled-up electro-spray air cleaner. The essentials will involve developing a well formed electro-spray, particle injection system, using instruments to quantify particle capture amongst others.

Position 2 : Theoretical investigations on the fundamentals of particle-droplet interactions and the development of a mathematical model for optimizing the performance of an ElectroHydroDynamic (EHD) Spray based air cleaner system.

The development of an air cleaner system using ElectroHydroDynamic (EHD) Sprays is being undertaken in our laboratory. The PhD work associated with this development will involve conducting boundary element and other CFD studies to obtain a fundamental understanding of the charged droplet-particle interaction processes. Towards this end, existing in-house codes, new in-house codes, and commercial CFD softwares will be used. Further, this understanding will be applied towards the development of a mathematical model to arrive at an optimum design for the prototype electro-spray-based air cleaner system. The models will involve particle capture efficiencies, hydrodynamics and electrostatics, population balance modeling and CFD studies.

Pay Details:

Consolidated salary Rs.31000/- p.m.

General information:

The position is for project staff (JRF) with a strong possibility of a PhD in chemical engineering with fellowship upto the duration of the project (the official duration is 3 years).

The appointment is for time bound project and the candidate is required to work mainly for the successful completion of the project. The selection committee may offer lower or higher designation and lower or higher salary depending upon the experience and performance of the candidate in the interview.

Candidates called for interview will be required to attend at his/ her own expenses.

For any queries/clarification please contact: recruit@ircc.iitb.ac.in