

Job Description

1. General Details

Job Code	Position Number 3152/IRC25831
Job Title	Postdoctoral Fellow (Green Chemistry 2.0: Integrated biochemical and mechanochemical methods for the environmental remediation and recycling of persistent organic waste pollutants) (Fund: CIRA-2018-68)
Reporting Line	Reports To: Dr. Sharmarke Mohamed
Department	Chemistry

2. Job Purpose

- To provide high quality research support and undertake internationally competitive research aimed at publication thereby contributing to the academic and research mission of the University.
- Since the Postdoctoral experience is transitional to becoming an independent researcher or faculty member, the Postdoctoral fellow tries their best to acquire the varied skills necessary to advance their career with guidance from the advisor. These skills include, but are not limited to, the ability to present research plans and findings in a convincing style, both in oral and written modes of communication, the ability to understand research group management and supervision of others, the ability to establish contacts and network with colleagues pursuing a similar research agenda, the ability to organize and teach a class or a course if more inclined towards a teaching career.

3. Key Roles & Responsibilities

Strategic Responsibilities

This multidisciplinary project combines mechanochemistry, microbiology, synthetic biology, synthetic organic chemistry, solid-state computational chemistry and process optimization techniques in order to develop a novel, green process for the degradation of environmentally harmful persistent organic pollutants (POPs), specifically polycyclic aromatic hydrocarbons (PAHs). In recent years, mechanochemical ball-milling techniques have shown great potential in the functionalization and synthetic preparation of supramolecular crystalline systems, nanoparticles, biomaterials, pigments and metal-organic frameworks. In some cases, mechanochemical techniques that require minimal or no solvent can facilitate the synthesis of "elusive" compounds not accessible via traditional solution-mediated organic chemistry techniques. There is also evidence that the high relative temperature and high mechanical impact frequency of solid materials within the ball-mill provide the optimum conditions for the degradation and remediation of PAHs. The hired postdoctoral fellow will pioneer the use of green mechanochemical methods for the functionalization, chemical conversion and degradation of PAHs. Real-time *in-situ* powder x-ray diffraction monitoring of the mechanochemical degradation of PAHs will be performed in order to characterize the poorly understood reaction pathway as well as the resulting byproducts. The postdoctoral fellow will synthesize and test the efficacy of a range of PAH nanoaggregation inhibitors in preventing the crystallisation and deposition of PAHs on a range of surfaces. The postdoctoral fellow will pioneer the use of catalytic biosurfactants isolated from microbial organisms and test the efficacy of a novel biosurfactant catalyzed

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mechanochemical remediation process that can facilitate the degradation of large-molecular weight PAHs into smaller-molecular weight byproducts.

Operational Responsibilities

The postdoctoral fellow will play a leading role in performing research leading to high-impact publications in the broad field of materials chemistry/crystal engineering. The postdoctoral fellow is expected to possess strong experimental research skills and ideally some computational materials modelling experience. The right candidate will spend most of their time in the laboratory where he/she will utilize their strong expertise in synthesis (organic or inorganic compounds) and materials chemistry/characterization in order to develop and validate a novel biosurfactant catalyzed mechanochemical remediation method for the green synthetic functionalization and conversion of persistent organic pollutants. In addition to performing research leading to high-impact publications in peer-reviewed materials chemistry journals, the postdoctoral fellow will work as part of a multidisciplinary team of molecular biologists, bioinformatics experts, chemists and chemical engineers in order to facilitate the deliverables of this exciting project.

Supervisory Responsibilities

The postdoctoral fellow will assist with the supervision and training of graduate students (PhD/MSc) in all aspects of their thesis work. The postdoctoral fellow will also support the training and development of undergraduate students on an ad hoc basis.

4. Qualifications & Experience

Required Qualifications

PhD in Chemistry or Allied Field.

Required Experience

The right candidate will possess strong technical expertise in one or more of the following areas: synthetic organic chemistry, analytical chemistry and materials chemistry/solid state chemistry. Competence in some or all of the following techniques is highly desirable: synthetic chemistry (organic/inorganic), materials characterization (X-ray Diffraction, ssNMR, IR Spectroscopy, MS), mechanochemistry and green synthetic chemistry techniques, crystallisation, crystal engineering, supramolecular chemistry, computational materials modelling (*ab initio* methods, DFT, Molecular Dynamics, Charge Density Analysis, Monte Carlo methods, Crystal Structure Prediction and Crystal Structure Modelling).