

The University of Queensland - IIT Delhi Academy of Research Joint PhD Project

PROJECT TITLE	INVESTIGATION OF THE INTERFACE BETWEEN ELECTROCHEMICALLY-ACTIVE MICROORGANISMS AND METALS
PROJECT CODE PROJECT DESCRIPTION	<p>UQIDAR 00174</p> <p>The ability to interact electronically with conductive materials is a defining feature of electrochemically-active microorganisms. This process, known as extracellular electron transfer, results in a microbially-derived current and has been investigated primarily from the vantage point of maximising power output or product yield in bioelectrochemical devices. As such, the majority of studies have focused on the interaction between these microorganisms and relatively low-cost conductive materials, such as graphite and other carbon-based electrodes. Reflecting the natural conditions in which most of these microorganisms have evolved, the microbial interface with iron has received considerable attention. However, the interaction with other relevant metals including gold, uranium and copper has been comparatively understudied. This study aims to examine the interface between these metals and electrochemically-active microorganisms during colonisation. Model electrochemically-active microorganisms will be used, including <i>S. oneidensis</i> and <i>G. sulfurreducens</i>, in addition to microorganisms enriched from natural materials (Au grains) and contaminated sites (U Mary Kathleen deposit and Cu “Mount Isa Mines) possessing the respective metal of interest. Electroanalytical techniques including voltammetry, chronoamperometry and electrochemical impedance spectroscopy will probe the microbe-metal interface and will be complemented by molecular biology techniques to refine current understanding of the microbial response to various metals. The findings will increase fundamental understanding of extracellular electron transfer and have the potential to identify novel modes of extracellular electron transfer useful in bioelectrochemical systems.</p>
PROJECT OUTCOMES	<ul style="list-style-type: none"> • Increased understanding of the interface between electrochemically-active microorganisms and metals • 1 x review article on the interface between electrochemically-active microorganisms and metals • 3 experimental articles • 1 x conference presentation by student
ADVISORY TEAM	<p>Professor Gordon Southam http://researchers.uq.edu.au/researcher/2716 g.southam@uq.edu.au School of Earth and Environmental Sciences The University of Queensland</p> <p>Assistant Professor Lucinda Doyle http://beb.iitd.ac.in/lucinda.html lucinda@iitd.ac.in Department of Biochemical Engineering and Biotechnology Indian Institute of Technology Delhi</p>
TYPE OF STUDENT	<p>Applications are open to i/a students who meet eligibility criteria. note: i-students must have own scholarship to apply (CSIR, UCG-NET, etc)</p>

DISCIPLINE
BACKGROUND
OF STUDENT

Ideally, this project requires students with a background in microbiology, biotechnology, materials science, geochemistry

IDEAL
CANDIDATE

Essential capabilities:

- Background in microbiology and basic chemistry

Desirable capabilities:

- Background in electrochemistry and materials science

Expected qualifications (courses, degrees, etc):

- Bachelors or Masters degree in relevant field.

APPLICATION
PROCESS

Apply online by the due date: <https://www.uqidar.org/students/how-to-apply/>