Faculty of Science and Engineering

2020 Australian Government Research Training Program Scholarships

Strategic Project Profile

PROJECT TITLE: Carbon Dioxide Electro-reduction in Ionic Liquids

FIELD OF RESEARCH CODE: 0306

PROJECT SYNOPSIS:

Carbon dioxide (CO_2) emissions are growing at an alarming rate globally, which will accelerate global temperatures and lead to increased severe weather events and natural disasters. Removal of CO_2 from the atmosphere is therefore a key target to achieve a sustainable future. This project aims to develop a detailed understanding of the CO_2 electro-reduction products in different electrolytes based on ionic liquids.

In contrast to the wide amount of research on CO_2 reduction in aqueous solutions, the electro-reduction products have been found to be very different in ionic liquids, leading to the possibility to design the electrolyte to produce targeted reduction products and useful fuels.

Different electro catalysts will be employed and stabilised in ionic liquids and ionic liquid-gels that have a high solubility for CO_2. Experimental and computational results will be combined to determine the optimum combination of electrolyte material and electrode catalyst for CO_2 absorption and removal, as a step towards a sustainable future.

FEASIBILITY AND RESOURCING – DESCRIPTION OF THE SUPPORT THIS PROJECT WILL RECEIVE:

The primary supervisor has substantial research funding through her ARC Future Fellowship (FT170100315) exte nding until July 2022. The co-supervisor has an ARC Discovery Project (DP190100735) that was funded in 2019-2022. Additionally, the associate supervisor has an ARC Future Fellowship finishing in 2022. Together, these subs tantial external research funds can be well utilised in this project.

WHAT MINIMAL ATTRIBUTES AND SKILLS EXPECTED BY THE CANDIDATE BE COMPETITIVE:

- A student would need to have (or be expecting) a 1st Class Honours or Masters degree in Chemistry or Chemical Engineering.
- Experience in electrochemical techniques and in surface characterisation techniques or catalytic materials synthesis would be an advantage.

THE SIGNIFICANCE OF THE PROJECT/ PROGRAM FOR THE ENROLLING SCHOOL OR INSTITUTION:

The electro-reduction of carbon dioxide contributes to the understanding of electrodes, surfaces and gases. This is directly relevant to research in the Curtin Institute for Functional Molecules and Interfaces (CIFMI) and the discipline of Chemistry, where the primary and co-supervisors are both situated. This will further enhance the already “above world standard" ranked Physical Chemistry research taking place at Curtin.

Students are advised to contact the Project Lead listed below prior to submission of their scholarship application to discuss their suitability to be involved in this strategic project.

PROJECT LEAD CONTACT

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