

An Indian-Australian research partnership

Project Title:	Glycerol to hydrogen and Chemicals using Chemical Looping	
Project Number	IMURA0810	
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Research Clusters:

Research Themes:

Highlight which of the Academy's CLUSTERS this project will address? <i>(Please nominate JUST one. For more information, see www.iitbmonash.org)</i>		Highlight which of the Academy's Theme(s) this project will address? <i>(Feel free to nominate more than one. For more information, see www.iitbmonash.org)</i>	
1	Material Science/Engineering (including Nano, Metallurgy)	1	Advanced computational engineering, simulation and manufacture
2	Energy, Green Chem, Chemistry, Catalysis, Reaction Eng	2	Infrastructure Engineering
3	Math, CFD, Modelling, Manufacturing	3	Clean Energy
4	CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control	4	Water
5	Earth Sciences and Civil Engineering (Geo, Water, Climate)	5	Nanotechnology
6	Bio, Stem Cells, Bio Chem, Pharma, Food	6	Biotechnology and Stem Cell Research
7	Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng	7	Humanities and social sciences
8	HSS, Design, Management	8	Design

The research problem

Glycerol is a low-value byproduct from biodiesel production and is produced globally in large quantities. On the other hand, most hydrogens for hydrogenation processes to make chemicals come from fossil fuel sources. There is a need for developing processes that use renewable feedstock and hydrogen sourced

from renewable sources for chemicals production at low emission footprint.

Project aims

This ambitious project based on fundamental science and engineering principles aims to demonstrate an operation that combines reforming of bio-glycerol to produce hydrogen and use that hydrogen to produce value-added/non-toxic chemicals using catalysis. Our target product is a valuable industrial chemical with wide applications in carpet and textile manufacturing to cosmetics, personal, and home care industry. The proposed project will contribute to the overall development of a potential renewable export (or domestic use) supply chain: biomass → biodiesel → glycerol → hydrogen and value-added chemicals or precursors to commercial products.

Expected outcomes

The expected outcomes of the project will include:

1. Hydrogen production from glycerol using metal oxides and their regeneration following the chemical looping principle
2. Catalytic synthesis of a target chemical using the hydrogen and glycerol
3. Simulation of a combined process that will pave the way for commercial development

How will the project address the Goals of the above Themes?

Describe how the project will address the goals of one or more of the 6 Themes listed above.

Working with renewable feedstock and combining the principles of reaction engineering, catalysis and process modelling, the project will address the Goals of the **Energy, Green Chem, Chemistry, Catalysis, Reaction Eng** theme.

Capabilities and Degrees Required

List the ideal set of capabilities that a student should have for this project. Feel free to be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.

1. Degree in Chemical Engineering with good understanding of Reaction Engineering and catalysis
2. Exposure to using analytical instruments – TPR, FTIR, XRD and TGA (preferable)
3. Experimental and process modelling skills (preferable)
4. Excellent writing skills and ability to synthesise ideas from literature review and global developments quickly into an executable form
5. Hard working and remaining focussed at all times while at both campuses

Potential Collaborators

Please visit the IITB website www.iitb.ac.in OR Monash Website www.monash.edu to highlight some potential collaborators that would be best suited for the area of research you are intending to float.

Discussed and agreed with Professor Santanu Bandyopadhyay.

Select up to **(4)** keywords from the Academy's approved keyword list (**available at <http://www.iitbmonash.org/becoming-a-research-supervisor/>**) relating to this project to make it easier for the students to apply.

Green Chemistry and Renewable Energy, Energy