

An Indian-Australian research partnership

Project Title: **Biobased chemicals production from macroalgae**

Project Number **IMURA0453**

Monash Main Supervisor
(Name, Email Id, Phone)

Dr. Antonio Patti
Chemistry Department
Monash University
Email: tony.patti@monash.edu

Full name, Email

Monash Co-supervisor(s)
(Name, Email Id, Phone)

Dr. Douglas Macfarlane
Chemistry Department
Monash University

Monash Head of Dept.
(Name,Email)

Steven Langford
steven.langford@monash.edu

Full name, email

Monash Department:

Department of Chemistry

Monash ADRT
(Name,Email)

Peter Betts

Full name, email

IITB Main Supervisor
(Name, Email Id, Phone)

Amit Arora
Email: aarora@iitb.ac.in
Phone: +91-22-2576-7293

Full name, Email

IITB Head of Dept
(Name, Email, Phone)

Prof. Rangan Banerjee
Email: head.ctara@iitb.ac.in
Phone: +91-22-2576-7883

Full name, email

IITB Department:

Centre for Technology Alternatives for Rural Areas

Research Academy Themes:

Highlight which of the Academy's Theme(s) this project will address?

(Feel free to nominate more than one. For more information, see www.iitbmonash.org)

1. Advanced computational engineering, simulation and manufacture
2. Infrastructure Engineering
3. **Clean Energy**
4. Water
5. Nanotechnology
6. **Biotechnology and Stem Cell Research**

The research problem

The controlled breakdown of lignocellulosic material directly into raw materials for the production of useful industrial chemicals is receiving much attention worldwide. Macroalgae from either freshwater or sea-water are rich in carbohydrates and provide alternative chemical feed-stocks for conversion of biomass to biofuels and useful chemicals. These algae contain different carbohydrate fractions to those found in terrestrial plant biomass and an understanding of their reactivity is important in order to understand the products that arise from their reactions.

This project will examine the reactivity of a range of model monosaccharides and disaccharides that comprise macroalgae, utilizing a range of solvents and focusing on acid catalysis. The model compound investigation will then be extended to natural macroalgae and could also be applied to terrestrial biomass. The aim of the work will be to determine if 5-hydroxymethyl furfural and levulinic acid products can be obtained and/or other related derivatives. These compounds are platform chemicals that will be produced in biorefineries of the future.

Project aims

1. To screen and characterize carbohydrates rich macroalgae
2. Development of technologies to maximize the sugars recovery
3. Optimized recovery of platform chemicals
4. Assessment of techno-economic feasibility of the developed processes

Expected outcomes

The project will deliver following outcomes:

1. Protocols for optimal recovery of high value chemicals from macroalgae
2. Through proper information dissemination, it is expected that the project outputs will increase interest among potential stake holders.

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

The proposed project is 'right on spot' in the domain of 'Clean Energy' and 'Biotechnology research' themes.

Capabilities and Degrees Required

Candidate should have at least one degree in Chemical engineering/ Pharmaceutical Sciences (M.Pharma With Thesis)/Biotechnology. This project requires strong understanding of Chemistry and biochemical engineering principles. Hands on experience with analytical instruments such as HPLC, Gas Chromatography, DSC and FTIR is desirable.

Please provide a few key words relating to this project to make it easier for the students to apply.

Biorefinery, biobased chemicals, macroalgae, Biofuels