

An Indian-Australian research partnership

**Project Title:** Evaluation of organic-inorganic hybrid nanocomposites for applications in electrodes for supercapacitors

**Project Number** IMURA0669(1)

**Monash Main Supervisor**  
(Name, Email Id, Phone) Prof. Jie Zhang  
jie.zhang@monash.edu *Full name, Email*

**Monash Co-supervisor(s)**  
(Name, Email Id, Phone) n/a

**Monash Head of Dept/Centre** (Name,Email) Kellie Tuck  
Kellie.Tuck@monash.edu *Full name, email*

**Monash Department:** School of Chemistry

**Monash ADRT**  
(Name,Email) Peter Betts *Full name, email*

**IITB Main Supervisor**  
(Name, Email Id, Phone) Prof. Sumit Saxena  
Sumit.saxena@iitb.ac.in *Full name, Email*

**IITB Co-supervisor(s)**  
(Name, Email Id, Phone)

**IITB Head of Dept**  
(Name, Email, Phone) Prof. N. Venkatramani *Full name, email*

**IITB Department:** Dept. of Metallurgical Engineering and Materials Sc.

## 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](http://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
7. Humanities and Social Sciences

## The research problem

*Define the problem*

Rapid depletion of fossil fuel has generated a urgent need for exploration of alternative efficient energy devices. In this persuit the development of supercapacitors has been second to none. Electrodes form the most important components of these devices and a lot of effort has been made to investigate materials

suitable for such applications. Layered materials provide large surface area and active sites for charge storage and hence increased pseudocapacitance. In this perspective the aim of the project would be to identify novel organic-inorganic hybrid nano composites using layered material for exploration toward application as electrodes in supercapacitors with high specific capacitance, higher stability etc. This is expected to require extensive literature review and understand the physical concepts, synthesize and characterize suitable materials combinations to explore their application as electrode materials for supercapacitors.

## Project aims

*Define the aims of the project*

Synthesis of suitable composite electrode material  
Material characterization using advanced characterization techniques  
Electrochemical characterization of the electrode material

## Expected outcomes

*Highlight the expected outcomes of the project*

New organic-inorganic hybrid nanocomposite materials for application as electrodes in supercapacitors  
Better understanding of pseudo charge storage mechanism in super capacitors which will enable in engineering of novel materials for this purpose

## 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.*

The aim of the project is to synthesize novel organic-inorganic hybrid nanocomposite using layered materials for electrode materials in supercapacitors which are energy devices.

## 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.*

Bachelors/Masters in Physics/ Chemistry/Materials Science/ Electrical engineering/Chemical Engineering

## Potential Collaborators

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

Prof. Jie Zhang

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

**Supercapacitors, Synthesis, characterization, electrochemistry**

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