

An Indian-Australian research partnership

**Project Title:** **Graphene-based composite sensors for real-time heavy metal monitoring in water environment**

**Project Number** **IMURA0874**

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### Research Clusters:

### Research Themes:

| Highlight which of the Academy's CLUSTERS this project will address?<br><i>(Please nominate JUST <b>one</b>. For more information, see <a href="http://www.iitbmonash.org">www.iitbmonash.org</a>)</i> |   | Highlight which of the Academy's Theme(s) this project will address?<br><i>(Feel free to nominate more than one. For more information, see <a href="http://www.iitbmonash.org">www.iitbmonash.org</a>)</i> |  |
|--|---|--|--|
| 1  | <b>Material Science/Engineering (including Nano, Metallurgy)</b>          | 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  | <b>Water</b>   |
| 5  | Earth Sciences and Civil Engineering (Geo, Water, Climate)                | 5  | <b>Nanotechnology</b>  |
| 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   |

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### The research problem

Heavy metals are obnoxious and toxic element in water. These heavy metals can be discharged to sensitive watercourses and even drinking water from different natural and anthropogenic sources. Different techniques are available to detect heavy metals in water; however, the research on real-time monitoring using in situ composite-based sensor is limited. Graphene is attracting significant attention in recent year due to its unique physical and electronic characteristics. Graphene-based nanomaterials are attractive for high-performance water sensors due to their unique properties, including high specific surface areas, high electron mobilities, and exceptionally low electronic noise. Because of potential risks to the environment and human health arising from heavy metal pollution in water, graphene-base water sensors are being developed for rapid and sensitive detection of heavy-metal ions.

### Project aims

This research aims to develop state-of-art graphene-based composite sensors for detecting heavy metals in the water. This research will ultimately put special attention of real-time heavy metal monitoring of water stream.

### Expected outcomes

By this project, we expect to find an efficient and cost effective way to fabricate graphene-based sensor to detect heavy metals in water. The applicability of the sensor will be in broad area of water, wastewater and drinking water. *Students will publish high quality research outputs in journal and academic conferences.*

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

Project directly falls into the theme of "water" and "nanotechnology" as it deals with detection of water impurities using nanotechnology based technique.

### Capabilities and Degrees Required

BTech, MTech, MSc in EE, Physics, Chemistry, Material Science, Green Energy, Laser, Optics, ME, CE, ESE or any other relevant field. Experience in surface patterning/preparation, optics or dispersion science would be preferred.

### 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.

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.

Water, Nanoscience, Smart manufacturing, Sensor networks