IITB-Monash Research Academy

Indian Institute of Technology Bombay | MONASH University

An Indian-Australian research partnership

Project Title:	Nanomaterials & ecosystems: Potential effect and involved processes	
Project Number	**IMURA0814**	
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IITB Department:	MEMS	

Research Clusters:

Highlight which of the Academy's CLUSTERS this project will address? *(Please nominate JUST **one.** For more information, see www.iitbmonash.org)*	
1	*Material Science/Engineering (including Nano, Metallurgy)*
2	*Energy, Green Chem, Chemistry, Catalysis, Reaction Eng*
3	*Math, CFD, Modelling, Manufacturing*
4	*CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control*
5	***Earth Sciences and Civil Engineering (Geo, Water, Climate)***
6	***Bio, Stem Cells, Bio Chem, Pharma, Food***
7	*Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng*
8	*HSS, Design, Management*

Research 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*
7	*Humanities and social sciences*

The research problem

Extraordinary properties of nanomaterials make them a potential candidate for water purification and contaminant sensing. Even, Nanoporous graphene have been recently suggested as a better replacement for reverse osmosis membrane for desalination and purification. Highly conducting graphene has also been

explored for detecting impurities/pathogens including water-oil separation. Though all the above mentioned areas have been explored widely, not much work has been done to find the effect of nanomaterials including graphene on water bodies where all these devices will be deployed. Here, in this project we plan to study the same. Synthesis of various nanomaterials such as gold nanoparticles, silver nanoparticles, ZnO, TiO2 including graphene will be performed at IIT Bombay. Basic material characterization and bio-activity will also be performed at IIT Bombay. Studies related to the effect of these nanomaterials on water bodies will be studied at Monash university, using analogues of pharmaceutical diffusing substrates. We also plan to examine potential effects of nanomaterials on key ecosystem processes such as photosynthesis, respiration and nutrient cycling.

Project aims

To study the effect of nanomaterials on key ecosystem processes – do these nanomaterials pose a threat to aquatic foodwebs?

Expected outcomes

Understanding the role of nanomaterials on fundamental ecosystem processes in aquatic ecosystems
Interplay of nanomaterials and photosynthesis
Relating the presence of nanomaterials on rates of biofilm respiration and nutrient cycling

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.

Project directly falls into the theme of "water" as it deals with the nanomaterial impact on the fundamental processes underpinning all aquatic foodwebs viz. photosynthesis, respiration and nutrient cycling

Capabilities and Degrees Required

BTech, MSc or MTech in Envionment Science, Pharma, Bio, Physics, Chemistry, Material Science, MEMS, Chem Engg, Elec Engg, Mech Engg, Nanotech or any other relevant branch

Potential Collaborators

Select up to **(4)** keywords from the Academy's approved keyword list **(available at www.iitbmonash.org)** relating to this project to make it easier for the students to apply.

Water contamination, Nanomaterials, Environment impact