

An Indian-Australian research partnership

<b>Project Title:</b>	<input type="text" value="Tunable photonic crystal by 4D patterning"/>	
<b>Project Number</b>	<input type="text" value="IMURA0740"/>	
Monash Supervisor(s)	<input type="text" value="Dr Boon Mian Teo"/>	<i>Full names and titles</i>
Monash Primary Contact:	<input type="text" value="Boonmian.teo@monash.edu"/>	<i>Email, phone</i>
Monash Head of Department:	<input type="text" value="Prof Bart Follink, Bart.Follink@monash.edu"/>	<i>Full name, email</i>
Monash Department:	<input type="text" value="School of Chemistry"/>	<i>Full name</i>
Monash ADRT:	<input type="text" value="Professor Coral Warr&lt;br/&gt;Coral.Warr@monash.edu"/>	<i>Full name, email</i>
IITB Supervisor(s)	<input type="text" value="Shobha Shukla"/>	<i>Full names and titles</i>
IITB Primary Contact:	<input type="text"/>	<i>Email, phone</i>
IITB Head of Department:	<input type="text" value="N Venkatramani"/>	<i>Name, Email,</i>
IITB Department:	<input type="text" value="MEMS"/>	<i>Full name</i>

## 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

## The research problem

Photonic crystals can be used in many applications such as optical waveguides, light emitting diodes, photonic lightwave circuits, highly reflecting mirrors, and optical filters etc. Lithography is a popular method for fabricating photonic crystals of monomaterial as well as composite material. Here we propose to photopattern in 2D as well as 3D to a thermoresponsive functional polymer. Different functionalities such as magnetic nanoparticles, metallic nanoparticles etc will be added to polymer for exploring various applications. Direct laser lithography will be used for making tunable photonic crystals. Fabricated photonic crystals will be characterized by reflectance spectroscopy and microscopy.

## Project aims

4D patterning of functional polymer for fabricating tunable photonic crystals

## Expected outcomes

By this project we expect to find an efficient and cost effective method to fabricate large area photonic crystals with doped active material. Devices that can be fabricated during this project could be following but are not limited to these only: photonic crystal laser, spaser, waveguides, coupler.

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

Various structures such as grating, fishnet, woodpile etc will be written by femto-second laser lithography. Essential part of this project would be to incorporate active materials such magnetic nanoparticles, metal nanoparticles etc into polymer via wet chemical route. Fabricated device characterization will be performed by uv-vis-NIR spectrophotometer, Fluorimeter, SEM, TEM etc.

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**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.