

An Indian-Australian research partnership

Project Title:

Project Number

Monash Supervisor(s) *Full names and titles*

Monash Primary Contact: *Email, phone*

Monash Head of Department: *Full name, email*

Monash Department: *Full name*

Monash ADGR: *Full name, email*

IITB Supervisor(s) *Full names and titles*

IITB Primary Contact: *Email, phone*

IITB Head of Department: *Name, Email,*

IITB Department: *Full name*

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

Photonic crystals are ubiquitous optical element which can be used in many applications such as optical waveguides, light emitting diodes, photonic lightwave circuits, highly reflecting mirrors, and optical filters etc. Photonic crystals can be fabricated by interference lithography, templating methods etc but direct lithography can surpass any other method easily. Direct laser lithography can be used to photopattern in 2D as well as 3D to any material system. Here we plan to use femto-second laser lithography for patterning functional polymer for making tunable photonic crystals. Fabricated photonic crystals will be characterized by reflectance spectroscopy and microscopy. Finally, fabricated photonic crystals will be used for lasing and sensing applications.

Project aims

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 followed but are not limited to these only: photonic crystal laser, spaser, waveguides, sensing platform.

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.. Fabricated device characterization will be performed by uv-vis-NIR spectrophotometer, Fluorometer, SEM, TEM etc. Lasing and sensing application will be explored in fabricated photonic crystals.

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.