

An Indian-Australian research partnership

<b>Project Title:</b>	Development of plasmonic metamaterials substrates for SERS application	
<b>Project Number</b>	IMURA0748	
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<b>IITB Department:</b>	MEMS	

## 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

Surface enhanced Raman spectroscopy is very useful and sensitive tool for detection at molecular level. Various material combinations and device architecture have been conceived, in the past, for improving the efficiencies of SERS processes. Gold based structures have been used in the past for manipulating the electromagnetic wave. Most of these studies utilize gold nanoparticles scattered throughout surface. Recently strategically patterned metamaterials including gold gratings have attracted attention as possible SERS substrate. In this project, we plan to use two-photon lithography for patterning plasmonic

substrate. Simulations will be performed to find the best architecture for enhancements. Finally all the patterned structures will be characterized and optimized using Raman spectroscopy.

### **Project aims**

Patterning of plasmonic materials  
Strategic patterning of plasmonic metamaterials  
Simulations of plasmonic metamaterials  
SERS on patterned substrate  
Optimize process iteratively for SERS substrate development

### **Expected outcomes**

Plasmonic metamaterials based structures simulations  
Patterned SERS substrate Process development for SERS substrate;

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

### **Capabilities and Degrees Required**

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

### **Potential Collaborators**

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

**Patterning, SERS, optical characterization, metamaterials**