Project Title: Development of plasmonic metamaterials substrates for SERS application

Project Number: IMURA0748

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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)

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
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