IITB-Monash Research Academy

Indian Institute of Technology Bombay | MONASH University

An Indian-Australian research partnership

Project Title:	**Wearable electrophysiological sensing devices for health monitoring**	
Project Number	**IMURA0675 (1)**	
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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

Define the problem:

In the last few years, wearable devices have gained a huge attention for biomedical applications because of their potential to continuously pick up and transmit signals from the human body in a non-invasive manner. Recent advances in fabrication of flexible and stretchable electronic devices have enabled the design of wearable sensing devices in thin, conformal form factors that naturally comply with the curved, soft, and dynamic human body, thereby enabling intimate contact necessary for high-fidelity physiological measurements. Several skin based biomedical devices are demonstrated to monitor electrophysiological (EP) signals, skin temperature, skin hydration, sweat, and even movement disorders . In this project, we will focus on fabricating skin like EP sensors for electrocardiography (ECG) (cardiac activity) or electromyography (muscular response), which are important electrophysiological diagnostic procedures where electrodes placed on the skin are used to monitor the electrical activity of specific organs.

Project aims

Define the aims of the project

Broadly, the project aims to fabricate arrays of micropatterned electrodes for EP monitoring with following features:

- Thin, conformable, expandable and softly laminating onto the surface of the skin without getting affected by the regular mechanical deformations.
- Developing and designing patterns for conformal adhesion and interfacing with epidermal skin layer.
- Developing electrodes with high performance
- Integration of sensor and electronic circuits

Expected outcomes

Highlight the expected outcomes of the project

- Demonstration of skin-like EP electrodes
- Knowledge generation, Publications and Patents
- Long lasting collaboration

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.

The project is aimed towards developing biomedical devices and hence suitable for the themes "Biotechnology" and "Nanotechnology".

Capabilities and Degrees Required

List the ideal set of capabilities that a student should have for this project. Feel free to be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.

We are looking for one Ph.D. student with following background:

1. B-Tech or M.Tech in Materials Science/Chemical/Electrical/Electronics/Biomedical Engineering
2. Previous experience in sensor fabrication, electronic interfacing, circuit designing will be a good asset.
3. Prior knowledge on ECG is a plus

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

Skin like electronics, Electrophysiological monitoring, ECG, EMG