

## Faculty of Engineering

### Summer Research Program 2022-2023

Project Title: Stretchable Organic Electronics

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#### Objective

The goal of this project is to engineer semiconducting polymers that are stretchable in order to enable next generation electronic devices that can bend and stretch with the human body.



#### Project Details

Conventional semiconductor devices are based on rigid semiconductors such as silicon. Although silicon has excellent semiconductor properties, it is not useful for applications which require mechanical flexibility or even stretchability. For sensors that interface with the human body, semiconductors that can flex and stretch are essential and will enable personal devices such as fitbits as well as medical sensors to be more ubiquitous and less obtrusive.

Semiconducting polymers have semiconducting properties similar to silicon but are mechanically more flexible. Good semiconductor performance and good mechanical flexibility don't necessarily go hand in hand, however. This is due to the semicrystalline microstructure typically associated with high performance polymers.

This project will investigate ways of engineering mechanical flexibility and even stretchability by blending semiconducting polymers with appropriate insulating polymers. One approach is to blend with an elastomeric material, while another approach is to use phase separation that results during blending to template a network structure. The effectiveness of each strategy will be evaluated with mechanical and electrical testing. This project will also provide experience with semiconductor device fabrication and testing.

#### Prerequisites

This project would suit a student with a background in materials science, physics, chemistry, or chemical engineering.

#### Additional Information

For more background information see: Lipomi, D., & Bao, Z. (2017). Stretchable and ultraflexible organic electronics. *MRS Bulletin*, 42(2), 93-97. doi:10.1557/mrs.2016.325.