FACULTY MENTOR Ng, Tina

PROJECT TITLE Short-Wavelength Infrared Photodiodes Based on Modular Tunable Conjugated Polymers

PROJECT DESCRIPTION

This project aims to develop short-wavelength infrared photosensors by using a new generation of narrow bandgap conjugated polymers. The polymer semiconductors are processed by solution processing techniques and allow printing deposition to bypass the limitations of die transfer and bonding in conventional devices. The proposed research will involve fabrication of photosensors and device characterization to identify the fundamental constraints in the exciton dissociation and charge collection processes as polymer bandgaps are reduced. The resulting knowledge will be applicable not only to infrared sensing applications but also to other areas including photovoltaics and optical communications, and will be essential to theoretical efforts to rapidly predict better photo-active polymers.

INTERNS NEEDED 1 MS Student AND 1 Undergrad Student

PREREQUISITES

ECE 103 required and ECE 136L preferred.

FACULTY MENTOR Ng, Tina

PROJECT TITLE Dual-droplet Electrohydrodynamic Printing of 2D Nanosheets

PROJECT DESCRIPTION

Atomically thin, 2D nanosheets are promising components for next-generation electronics. However, there is a lack of scalable manufacturing processes to fully showcase the superior properties of nanosheet materials. Digital fabrication in the pico-liter regime presents new opportunities in nanosheet alignment controls, because the proposed configuration minimizes the solvent mixing and guides the nanosheets to spread and unfurl, in contrast to crumpled nanosheets in a typical inkjet droplet deposition. Research results can enable the development of a unique additive manufacturing platform for patterning nanosheets, as well as other anisotropic colloidal particles (e.g., nanowires, and quantum dots).

INTERNS NEEDED 1 MS student

PREREQUISITES

ECE 103 required and ECE 136L preferred.