Technische Universität Dresden | Helmholtzstr. 10, 01069 Dresden

Institute of Solid-State Electronics
Chair of Biomedical Sensor Technology

Offer for Coursework / Diploma/Master Thesis / Thesis

Topic: **Characterization of Near-Infrared Organic Photodiodes for Optical Deformation Sensing in Biological Tissue**

Organic photodiodes (OPDs) have emerged as promising optoelectronic devices for biomedical applications due to their low-cost fabrication, spectral tunability, and potential for lightweight and conformable device integration. The main objective of this project is to investigate how near-infrared (NIR) OPDs can be used as optical sensors for detecting mechanical deformation in biological tissue. Porcine skin will be used as a representative specimen to study the changes in transmitted or reflected NIR light intensity during controlled stretching and relaxation. The designed research study will focus on the characterization of NIR organic photodiodes and their integration into an optical measurement setup for detecting deformation-induced changes in light propagation through biological tissue.

Within the framework of this thesis, the following subtasks are to be worked on:

Task 1: Development of the optical deformation sensing setup

- Develop an experimental setup combining an NIR laser diode as light source, organic photodiode, and biological tissue sample.
- Investigate transmission and/or reflection-based detection approaches.
- Establish a controlled experimental setup for mechanically stretching the porcine skin sample and recording the corresponding optical signal.

Task 2: Investigation of deformation-dependent optical signals

- Measure the optical response of porcine skin under different deformation stages and light intensities.
- Correlate the photodiode signal with the applied mechanical deformation.
- Investigate sensitivity, repeatability, linearity, and response behaviour of the optical sensing system.
- Evaluate the potential of NIR organic photodiodes for non-contact or minimally invasive biomechanical sensing applications.

Suitable for students of biomedical engineering, all electrical engineering or physics-related degree programs.

Supervisor: Dr. Sudhi Mahadevan, *sudhi.mahadevan@tu-dresden.de*

Supervising professor: Prof. Dr. Caroline Murawski, *caroline.murawski@tu.dresden.de*