

SEMS: RESEARCH PROJECT DESCRIPTION

1. Project Background and Description

Title: High performance polymer thermoelectrics by morphological control

Description:

Thermoelectric materials generate a voltage from a temperature gradient. Thermoelectric generators made from these materials can recover waste heat and convert it into electrical power. These devices have potential for powering small electronic devices, and in the future a thermoelectric generator placed on someone's skin could even generate electricity from their body heat to power a wireless medical sensor. However, significant materials challenges still need to be overcome in order to obtain high thermoelectric performance materials and efficient devices.

One promising new class of thermoelectric materials are conducting polymers. These materials are flexible, highly processable, non-toxic and low-cost, making them suitable for wearable thermoelectric devices. However, it is becoming clear that their performance is highly dependent on the nanoscale morphology of the polymer. This project will aim to characterise the nanoscale morphology of thermoelectric polymers and link this to performance – ultimately developing optimal morphologies for high thermoelectric performance.

2. Project Scope

Research project objectives:

- 1. Characterisation of the nanoscale morphology of thermoelectric polymers by scanning probe microscopy, GIWAXS and high-field NMR.*
- 2. Correlate morphology with thermoelectric performance in model systems.*
- 3. Develop polymers with optimized morphology and improved thermoelectric performance.*

3. Desired Skills from the Student

- Experience in any of:
 - Energy materials.
 - Materials characterization.
 - Energy devices.
 - Thermoelectrics
 - Halide perovskite materials
- The ability to work in a laboratory environment.

Qualifications in any of: Materials Science, Physics, Engineering.

4. Supervisory Team

Primary: Dr Oliver Fenwick

Secondary: Dr Joe Briscoe