

PDOT:PSS for material moisture measurement in natural fibre composites

Master thesis proposal, IMSAS, University Bremen

Motivation

PDOT:PSS is one new organic semiconductor material that can be applied for several sensing applications.

In building construction, there is a trend to use organic, environmental friendly materials. However, there is a risk that such materials, especially gluing lines and epoxy components lose stability if moisture penetrates in the material. A sensor system should warn, if there is a risk of material fatigue or even break down.

Samples of paper printed PDOT:PSS sensors were produced during an earlier project. Some samples were embedded in a composite material based on natural plant fibres. First test proved that it is feasible to detect if moisture has penetrated into the fibre material by this sensing approach.

Approach

After getting used to the production and test procedure, literature study and theoretical background, the thesis will start with the integration of existing PDOT:PSS samples in fibre material and characterization of the sensor properties.

The focus of the thesis will be defined after the initial phase according to the student's interests and result of pre-tests, including topics and tasks such as (depending on project definition):

- Produce further paper printed PDOT:PSS sensors and test alternate printing processes
- Optimize sensitivity for the required sensing range
- Test under different temperature and moisture (percentage weight content of water)
- Test further sensor properties such as hysteresis, time behaviour, repeatability

Goal

- Improve our first sensor prototype and characterize its sensing properties.
- Provide a sensor that can be integrated in wood / natural fibre construction material for detection / warning of moisture damages.
- Convert measurement signal to percentage moisture content (so far as possible, or estimate measurement accuracy/error)

Requirements

- Interest in experimental work and new sensor materials
- Careful work and documentation
- Finish tasks in time

The number of credit points is equivalent to ten weekly seminars. Accordingly, we expect a high commitment over 6 months. The experiments require regular presence in the laboratories.

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