Master's Thesis

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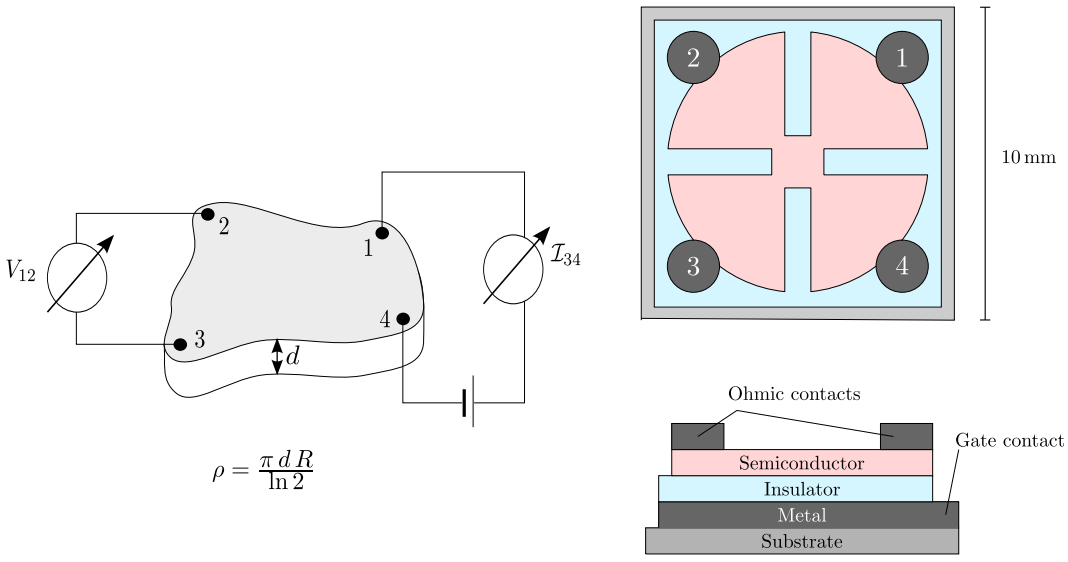
Electronic characterization of molecular semiconductors

Background: The soft material properties of organic semiconductors make them attractive for future display technology. Think about foldable cell phones or large area screens that can be rolled up. The development of such devices, however, requires an excellent understanding of the physics of charge transport within these semiconductors. The goal of our research is to advance this understanding with characterization techniques that cover transport distances form the molecular level up to the macroscopic dimensions of entire devices.

Experiments on charge transport can be spoiled by many extrinsic effects, most often by electronic contact resistances. One outstanding technique that circumvents these perils is the Van der Pauw method. It allows measurements of the semiconductor's conductivity and provides a direct view onto the charge transport across the device.

Topic and task: The work of the thesis will start with the characterisation of a prototype setup for Van der Pauw's method. Based on the outcome of this analysis, devices of molecular semiconductors will be fabricated in collaboration with other team members. This involves physical vapor deposition (PVD) of the molecular semiconductor and of the metal contacts, as well as chemical vapor deposition (CVD) of the device's insulator.

Status: A prototype setup including basic software is available.



Left: Schematic of Van der Pauw's method for measuring the conductivity. Right: Layout of a semiconductor device for characterization.

References:

- `https://en.wikipedia.org/wiki/Van_der_Pauw_method`
- `https://doi.org/10.1021/acs.jpclett.7b02304`

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