



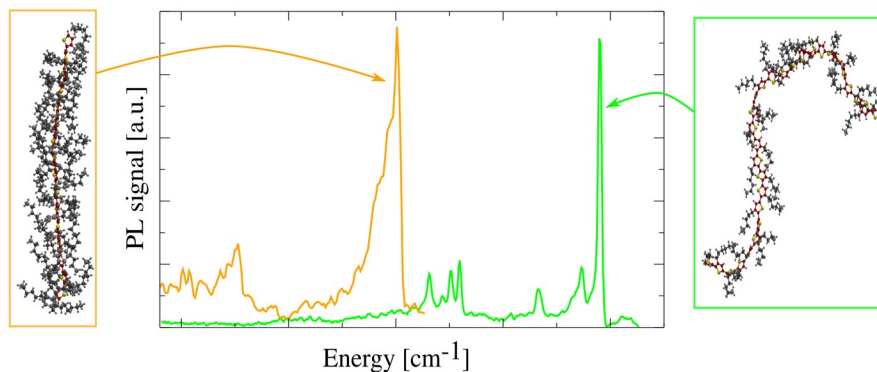
# Single-Molecule Spectroscopy on Conjugated Copolymers for Solar Cells

*Master research project*

## **The idea:**

Organic solar cells (OSC) based on low-bandgap copolymers, the second generation of conjugated polymers, recently achieved efficiencies  $> 17\%$ . The key advantage of such low-bandgap copolymers for OSCs is that upon light absorption the electron density is strongly displaced and a so-called charge-transfer excitation on a single chain is generated. This charge-transfer state is then rather easily separated into free charge carriers, enabling a high OSC efficiency.

However, copolymers are, as any polymer, highly disordered. Thus, the correlation between chain conformation (geometric structure) and the spectroscopic properties (position and shape of optical spectra) are not well understood so far. In this project you will perform optical spectroscopy on single copolymer chains, looking at one chain at a time, at low temperature (4 K) to establish structure-function relationships. A short introduction into this topic can be found in Francken Vrij, 23.3, pp. 28.



## **Your contribution:**

- You perform low-temperature single-molecule photoluminescence spectroscopy on different low-bandgap copolymers provided by our chemistry collaborators (Chiechi-group);
- You cooperate with theory (R. Havenith) to establish relationships between the chain conformation and optical properties;
- You operate state-of-the-art equipment for optical (single-molecule) spectroscopy.

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