

Nonfullerene acceptors for commercially viable organic photovoltaics (3.30 pm)

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The commercialization of OPV requires the availability of inexpensive materials in large quantities, such as poly(3-hexylthiophene) (P3HT). P3HT is readily scalable via flow or micro-reactor synthesis, even using green solvents, whilst retaining a high degree of control over molecular weight and regioregularity. However, it has a limited open-circuit voltage (V_{oc}), short-circuit current (J_{sc}) and stability in photovoltaic devices when fullerene derivatives are used as acceptors. This talk will focus on the alternative small molecule non-fullerene acceptors that can potentially lead to commercially available organic photovoltaics. In particular, structure-property relations, recombination processes and reliability results for record efficiencies will be discussed.

Organic semiconductors for thermoelectric energy generation (4.15 pm)

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Over the decades, scientific evidence has mounted that the emission of anthropogenic greenhouse gases is the main reason for the increase of surface temperatures observed on Earth. Abandoning fossil fuels in the short term, however, is both technologically difficult and economically risky. Therefore, it would be advantageous to use the produced energy more efficiently thereby curbing the overall energy production and ultimately the greenhouse gas emissions. Around 60% of the energy input is lost after conversion as waste heat, of which half is so-called low temperature (<math> < 200^{\circ}\text{C}</math>) waste heat. A technology suitable to recover waste heat and transform it into usable electricity is thermoelectric generators. Due to the so-called Seebeck effect, applying a temperature differential across a suitable material will generate an electric voltage. Recovering the low-temperature waste heat however via thermoelectric generators is challenging, mainly because current technologies are based on rare, often toxic elements (*i.e.* tellurium, lead, ...); and as a result, thermoelectric modules are rather expensive and can only be efficiently operated at elevated temperatures. It is therefore paramount to develop new thermoelectric materials, able to harvest low-temperature waste heat efficiently.

The ideal thermoelectric material possesses a high electrical conductivity, while at the same time being an excellent thermal insulator. Whereby it is relatively straightforward to find materials which fulfil one of these critical requirements, it is much more difficult to find a single material accomplishing both. Materials based on conjugated polymers, on the other hand, are attractive candidates for thermoelectric materials because they are known to be relatively good electrical conductors and at the same time excellent thermal insulators. In this talk I will discuss several approaches we are exploring to synthesise conjugated polymers specifically for thermoelectric applications, thereby explicitly focussing on morphologically stable organic conductors and investigating design criteria towards more suitable intrinsic n-type conductors.