GESELLSCHAFT DEUTSCHER CHEMIKER

Ortsverband Osnabrück

Supramolecular Semi-Conducting Materials – From Synthesis to Properties and Applications

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The interest in the area of semiconducting polymers (SMPs) for organic electronics has intensified during the past few decades as a consequence of their numerous advantages over conventional inorganic materials [1]. Being in direct competition with inorganic thin-film and crystalline silicon photovoltaic, there are still many points for improving SMPs`s charge carrier mobility that is the main difference between the organic and inorganic materials [2]. Although tremendous effort has been devoted to tune SMPs's charge-transport properties through molecular design undesirable long wavelength emission bands considerably affects electronic properties of SMPs.

To achieve greater control over interpolymer interactions, SMPs can be encapsulated with a protective macrocyclic sheath, thereby manipulating the distance between chains and preventing crosstalk and hindering fluorescence quenching, even when only a small fraction of the backbone is encapsulated. By doing this, we have been able to exploit various desirable photophysical and electrical properties of so-called supramolecular SMPs [3-7].

A series of novel supramolecular SMPs of polypseudorotaxanes (PPs) or polyrotaxane (PRs) types based on poly(3,4-ethylenedioxythiophene), polyfluorenes homo-/copolymers and polyazomethines, will be presented. The improvements of photophysical properties, such as control of over conformational defects, morphology and solid-state packing effects accessible by molecular encapsulation, presented in this lecture, will inspire the audience toward future research endeavors. Furthermore, we want to enlighten that macrocyclic encapsulation open the gates to unprecedented opportunities in many fields of science and technology.

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[3] A. Farcas, A.-M. Resmerita, Supramolecular chemistry: synthesis and photophysical characteristics of conjugated polyrotaxanes, in: *Encycl. Phys. Org. Chem.* **2017**, *3*, John Wiley & Sons, USA, pp. 2543-2582.
[4] A. Farcas et al., Cucurbit[7]uril-threaded poly(3,4-ethylenedioxythiophene), *Eur. J. Org. Chem.* **2019**, 3442–3450.
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[6] A. El Haitami et al., Synthesis, photophysics and Langmuir films of polyfluorene/permodified cyclodextrin polyrotaxanes, *Langmuir* **2021**, *37*, 11406−11413.
[7] A. Farcas et al., Structural characteristics and the label-free detection of poly(3,4-ethylenedioxythiophene/ cucurbit[7]uril) pseudorotaxane at single molecule level, *Nano Research* **2022**, https://doi.org/10.1007/s12274-022-4918-x.

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Besucher sind herzlich willkommen!

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