Programmed Nanostructuration of Organic π-Conjugated Materials

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Abstract.
The project PROGRAM-NANO aims at establishing unconventional and versatile strategies towards organic nanofibers or nanotubes whose size, composition, internal structure, and function can be rationally predesigned and controlled at the nanoscale. In a first stage, specific cyclic tetramers are formed from 4 monomeric π-conjugated subunits by hydrogen-bonding interactions between perpendicular directors.[1,2] These discrete tetramers then stack into highly ordered tubular nanostructures guided by the cooperative action of the parallel directors.
We want to focus on two main objectives for the application of such organic nanostructured materials:

1) The design and preparation of optoelectronic devices, such as plastic solar cells, where nanostructured fibers are integrated within the active layers. The major goal is to determine the influence of the molecular organization and the morphology at the nanoscale on the performance of the device, and to try in this way to set new records in device efficiency;
2) The fabrication of nanoporous materials for the selective separation, storage or catalytic transformation of (bio)molecules in which the size, the shape ratio, and the internal functionalization of the nanopores can be custom-tailored.

References

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[2] D. González-Rodríguez, J. L. J. van Dongen, M. Lutz, A. L. Spek, A. P. H. J. Schenning, E. W. Meijer, *Nature Chem.* **1** (2009) 151.

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