Rational design of complex functional materials: synthesis and self-organisation to nanostructures

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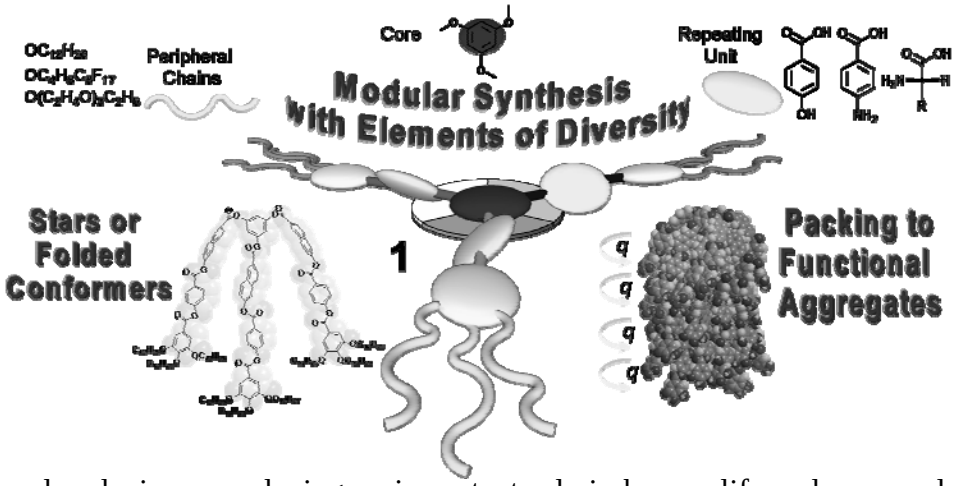

Complex devices are playing an important role in human life and on a molecular scale, they are essential for most biological processes. For the latter, polymeric frameworks operate as organisation matrices for individual functional units. Star-shaped molecules of type **1** are the simplest branched oligomeric scaffolds which can be tailored for the self-organisation in soft materials.[1] The compounds consist of numerous elements of diversity: (i) core unit, (ii) number and type of repeating units and (iii) peripheral chains. The appealing self-assembly process is controlled by the filling of void space between the arms, which can be achieved by folding and packing of the molecules or the incorporation of guests.[1] The supramolecular properties can be programmed for these simple artificial systems. For example, desymmetrisation of the benzoate scaffold by varying the length of the individual arms lead to 2D hexagonal columnar, highly ordered 3D columnar, and cubic mesophases. Functional materials are obtained when chromophores are integrated, showing e.g. high charge carrier mobilities.[2]

In this contribution, we present the synthesis of C_3- and non-C_3-symmetrical star-shaped mesogens consisting of oligoesteramide building blocks. The influence of H-bonds on the self-organisation process to complex structures is investigated. Mesophase structures are determined by interplay of microscopic methods, UV-Vis and fluorescence spectroscopy, X-ray diffraction and modelling.

References

(1) M. Lehmann, *Chem. Eur. J.* **2009**, accepted (invited Concept Article)

(2) M. Lehmann, M. Jahr, F. C. Grozema, R. D. Abellon, L. D. A. Siebbeles, M. Müller, *Adv. Mater.* **2008**, *20*, 4414 – 4418.