Generation of Void with Shape-Persistent Mesogens – Benefit or Malediction for the Formation of Liquid Crystals?

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Liquid Crystals (LC)) combine anisotropic properties of crystals with the fluidity of isotropic liquids and are well known for their application in LC-Displays. Beyond this technology, this fourth state of matter plays an enormous role in nature and materials science. For the latter, the facile preparation of thin oriented films or fibres with a high structural control is of great interest. That way, electronic devices can be prepared such as light emitting diodes, field effect transistors or photovoltaic cells.

The focus of our research is the control of liquid crystal self-assembly from the nano- to the macroscale by rational design of functional molecules. We aim the synthesis of shape-persistent molecules to keep the control over the molecular and mesophase morphology. However, such molecular scaffolds produce void, which has to be filled in soft condensed phases. This presentation will show cases in which void can be beneficially used in order to generate, for example, highly ordered donor-acceptor multicables. In the search for biaxial nematic liquid crystals, a family of V-shaped molecules is highlighted, for which void seems to be of great disadvantage. Besides the design and synthesis of the target structures, a comprehensive structural study by means of X-ray scattering, FT-IR microscopy and solid-state NMR spectroscopy has been performed and confirms our results.

Selected References:

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