Shape-Persistent, Star-Shaped Host-Guest Supermesogens
M. Lehmann,* P. Maier, B. Fröhlich and M. Hügel

1 Institute of Organic Chemistry, University of Würzburg, Würzburg, Germany

Star-shaped mesogens are non-conventional liquid crystalline compounds composed of linear arms symmetrically attached to a multifunctional core.[1] The void between the arms increases with increasing arm length and has to be compensated during the self-assembly process. Most of the molecules are flexible enough to fold in order to improve space-filling and nanosegregation. Shape-persistent molecules can form mesophases without considerable spacial rearrangement of the molecular scaffold. For stilbenoid structures 1 the free space is filled by translation and rotation about the centre of the column and slight conformational changes about single bonds between aromatic units and double bonds without loss of the star morphology.[2] These parent compounds self-organise in columnar hexagonal mesophases. It is very attractive to fill such free space with guests, which may either be covalently attached to the arms or the core, or supramolecularly introduced by simply mixing the hydrogen bond acceptor with a donor. The latter has been realised earlier in semi-flexible melamine derivatives. In such star-shaped mesogens which may be considered as endoreceptors only one guest could be included,[3] whereas three arms could be attached when a mesogenic core with an alkyl chain or only one mesogenic arm was used to form a supermesogen by an exorecognition process.[4] The acceptance of three guest molecules in an endoreceptor may be possible for shape-persistent stars with extended arm structures 2. With this strategy, it will be possible to generate nanostructured columnar liquid crystals with alternately positioned functional units, which are of high interest for organic electronics.

The present contribution will show a comprehensive X-ray study and modelling of stilbenoid star mesogens indicating that star conformers with intrinsic void between arms self-assemble in columnar LC phases. The preparation of the hexa-substituted benzene derivatives 2 will be detailed which enables the compounds to accept three hydrogen bond donors as guests in the liquid crystalline phase. This is to the best of our knowledge the first liquid crystalline endoreceptor accommodating up to three guest molecules.

References:

* presenting author; E-mail: Matthias.Lehmann@uni-wuerzburg.de