Laudatio for Prof Dr Carsten Tschierske on the occasion of receiving the Alfred-Saupe medal of the German Liquid Crystal Society

This year Prof Carsten Tschierske from the University of Halle-Wittenberg received the Alfred Saupe medal of the German Liquid Crystal Society for his sustained outstanding contributions to the field of liquid crystals. The honouring ceremony was held on occasion of the 41st German Liquid Crystals Society meeting in Madgeburg (25-27. 03. 2014). The medal was handed to Prof Tschierske by Prof Rudolf Zentel, the Chairman of the German Liquid Crystal Society.

Prof Tschierske has contributed to the field of liquid crystals through the design and synthesis of molecules and the investigation of the phase structure of these systems, covering a wide range of molecular architectures and phase types. Moreover, he contributed to the education of scientists by a number of outstanding reviews on supra-molecular liquid crystals, bent-core systems, nematics and bolaamphiphilic and polyphilic liquid crystals.

Prof Tschierske started his scientific career in Halle, where he studied Chemistry and completed his PhD in 1985 in the liquid crystal group, led at that time by Prof Zaschke. He continued his research in the field as a staff researcher, resulting in a habilitation in 1990. Following the dissolution of the GDR, he held visiting positions in Marburg and Würzburg, before being appointed to the position of Professor of Organic Chemistry at the University of Halle-Wittenberg in 1994. Since then he has held a visiting position at Kyushu University (Japan), he has been the Chairman of the German Liquid Crystal Society, he is also a member of several editorial boards of leading Chemistry journals and has given a large number of invited and named lectures.

Prof Tschierske has since he started as an independent researcher progressed the field of liquid crystal research significantly in many different areas.

A notable example is his work on the rational engineering of novel liquid crystal phase structures based on the control of nano-segregation and self-assembly in small molecules, typically not larger than 3-4 nm. Here the combination of mainly linear rod-shaped mesogens, but also including “T-“ and “X- shaped” architectures in combination with a number flanking groups has generated a large range of phase structures hitherto unreported for liquid crystals. The flanking groups employed include perfluorinated groups, silane and siloxane groups, hydroxyl functions and ethylenoxy and hydrocarbon chains which have been linked to the extended aromatic cores at various positions. The driving force behind the formation complex phase structures was identified as a combination of the volume taken up by the different chemical functions, the tendency of some to nano-segregate, of others to mix and to self-assemble at various temperatures as a function of molecular architecture, temperature and flexibility. Careful variation of size and positioning of the components has allowed to go from lamellar phases built up by the aromatic groups to a number of columnar phases where the ordered mesogens are at the edge columns to those where they form columns surrounded by disordered moieties as well as to cubic arrangements; all investigated in a systematic manner. Generally speaking, the wealth of morphology that had been observed earlier for phase separating block-copolymers on the micron and submicron scale was generated by Prof Tschierske and his co-workers on the nanometrc scale using organic tectons. It demonstrated the universality and the power of the tools of self-assembly and phase separation across length scales. This work was in parts carried out in a strong and international collaboration with the group of Prof G. Ungar at the University of Sheffield, UK. During this work the concept of the perforated phase structures or

“honey-combs” was introduced, as well as colour mapping in two and more recently three dimensions. A highlight is clearly the designed discovery of liquid quasi crystalline phase behaviour in such systems. This body of work has changed our understanding of what is possible in terms of self-assembly for liquid crystals.

In parts related, especially very recently, is the work of Prof Tschierske on chiral systems in liquid crystals. An early highlight is the introduction of allenes introducing axial chirality, followed by the use of cyclophanes as new chiral groups in LC research. A large body of work has focused on the chiral phases of non chiral bent–core molecules. Here the design of a large number of molecular architectures together with the very careful investigation of the phase behaviour by optical polarizing microscopy, differential scanning calorimetry, electro-optical studies and XRD investigations allowed to elucidate a number of smectic subphases, including polar phases, nematic subphases and the formation of chiral self-assembly of such systems in the isotropic. This has been recently extended to the observation of bicontinuos chiral cubic and chiral isotropic phase behaviour in non-chiral molecules using hemi-phasmidic architectures .

In the investigation of the polar phases of bent-core systems Prof Tschierske elucidated too much of the structures of the SmA and nematic subphases, a research area where he has also added significantly with the first reports on the SmA-biaxial phase, using metallo-mesogens.

Looking at a record of more than 300 publications, this list of achievements and “firsts” is not complete. It is however a record of an extremely successful research effort, longstanding national and international collaborations, often in EU sponsored interdisciplinary projects and a dedicated research group, educated locally in Halle as well as recruited from around the globe.

Professor Tschierske has over the years continued the long tradition of excellence in LC research in Halle, started with Vorländer almost a century ago and is a well deserving recipient of the Alfred-Saupe medal.

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