

Martin-Luther-Universität Halle-Wittenberg
Naturwissenschaftliche Fakultät II
Chemie und Physik
SFB TR 102



SFB/TRR 102-KOLLOQUIUM

am Donnerstag, dem 07.06.2012, 17.15 Uhr,

Gustav Mie Hörsaal, Theodor – Lieser - Str. 9, 06120 Halle

Es spricht:

Prof. George Floudas

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zum Thema:

“Discotic liquid crystals in motion”

Discotic liquid crystals (DLCs) are materials where self-assembly is driven by non-covalent intermolecular interactions. During the self-organization process, the disk-shaped molecules organize into columns that further assemble into two-dimensional arrays whereas the alkyl chains fill the intercolumnar space. Highly ordered columnar structures of hexa-peri-hexabenzocoronenes (HBC) were found to be very promising as active semiconductors in organic FETs (molecular wires) and photovoltaic devices. The self-assembly and molecular dynamics in a series of dipole functionalized nanographenes were studied using thermodynamic (DSC, PVT), structural (WAXS) and dynamic (DS, site-specific NMR, Rheology) probes [1-5]. These DLCs undergo a phase transformation from a dipolar ordered but structurally disordered liquid crystalline (LC) phase at higher temperatures to a dipolar disordered but structurally ordered crystalline phase (Cr) at lower temperatures [4]. The effect of dipole substitution is to change the energetics and to stabilize the LC phase. Within the LC phase the intra- and inter-columnar thermal expansions were different but both positive. In contrast, the Cr phase shows a negative thermal expansion (NTE) [3]. With respect to the dynamics, these small molecules display a range of hierarchical molecular motions (i.e. polymer-like) ranging from 0.01 ps to hours as shown by FTIR, NMR, DS and Rheology [5].

[1] M. M. Elmahdy, G. Floudas, M. Mondeshki, H.W. Spiess, X. Dou, K. Müllen, Phys. Rev. Lett. 100, 107801 (2008).

[2] M. M. Elmahdy, X. Dou, M. Mondeshki, G. Floudas, H.-J. Butt, H.W. Spiess, K. Müllen, J. Am. Chem. Soc. 130, 5311 (2008).

[3] C. Grigoriadis, N. Haase, H.-J. Butt, K. Müllen, G. Floudas Adv. Mater. 22, 1403 (2010).

[4] C. Grigoriadis, N. Haase, H.-J. Butt, K. Müllen, G. Floudas Soft Matter, 7, 4680 (2011).

[5] M. R. Hansen, X. Feng, V. Macho, K. Müllen, H.W. Spiess, and G. Floudas Phys. Rev. Lett., 107, 257801 (2011).