

Deuterium NMR studies of molecular order in V-shaped mesogens exhibiting the biaxial nematic phase

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After a long time quest for the biaxial nematic phase, theoretically predicted by Freiser in 1970¹, bent-core compounds were the first low-molecular weight thermotropic liquid crystals where evidence for this phase was coherently supported by several independent experimental techniques². For this purpose, deuterium NMR spectroscopy played an important role, since order effects induced by surface are ruled out as this type of experiments are performed on bulk samples³. Recently, the synthesis of new series of shape persistent V-shaped mesogens with four lateral aliphatic chains and different types of bending units opened new trends of phase engineering in the search for stable biaxial nematic phases⁴. Optical observations and X-Ray diffraction measurements on aligned samples showed indications for biaxial nematic ordering for nematogens with fluorenone bending units exhibiting monotropic nematic domains⁵. These results are supported by preliminary deuterium NMR results for a deuterated derivative in its nematic glass. In the present study, the analysis of deuterium NMR spectra as a function of temperature is performed to investigate the biaxial nematic ordering previously observed in the fluorenone derivative by other experimental techniques⁵.

(1) M. J. Freiser, *Phys. Rev. Lett.* **1970**, *24*, 1041 (1970)

(2) L. A. Madsen, T. J. Dingemans, M. Nakata and E. T. Samulski, *Phys. Rev. Lett.* **2004**, *92*, 145505; B.R. Acharya, A. Primak, and S. Kumar, *Phys. Rev. Lett.* **2004**, *92*, 145506

(3) G. R. Luckhurst, *Thin Solid Films* **2001**, *393*, 40

(4) M. Lehmann, C. Köhn, H. Kresse and Z. Vakhovskaya, *Chem. Comm.* **2008**, 1768

(5) M. Lehmann, S.-W. Kang, C. Köhn, S. Haseloh, U. Kolb, D. Schollmeyer, Q. Wang and S. Kumar, *J. Mater. Chem.* **2006**, *16*, 4326