

A thermotropic monotropic biaxial nematic phase

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The design of roof-shaped nematogen **1** realizes a molecule with high molecular biaxiality i.e. is a biaxial aspect ratio $L : B : W$ (Figure 1) and an optimum local interdigitation of lateral and terminal aliphatic chains to prevent the rotation about the long molecular axis. In this nematic self-assembly the major and minor axes possess orientational long range order while the positional long-range order is completely absent. Such a phase is called the biaxial nematic phase. With lateral chains of equal length or branched chains local biaxiality was observed and owing to the special self-assembly, the material showed a rather high electron mobility for a nematic phase.[1]

Roof-shaped
nematogen design

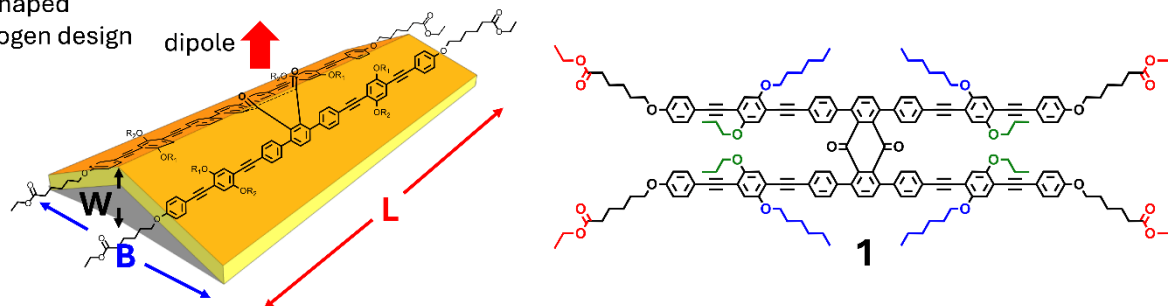


Figure 1: Roof-shaped nematogen with high molecular biaxiality.

In this study, nematogen **1** has been explored in detail in homeotropic thick and thin films by conoscopy. While there is clear evidence for a biaxial director field of tilted mesogens in the thick films (20 μm), the results from thin films (1 μm) agrees with phase biaxiality, but a molecular tilt cannot be excluded. The temperature-dependent investigation of a perfectly planar aligned sample by measurement of capacitance and resistance clearly revealed the alignment of the minor axis with the dipole parallel with the substrate while the major axis remained aligned along the rubbing direction in the monotropic range of the nematic phase. This supports the finding of a monotropic biaxial nematic phase.

References

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