

NMR Study of Molecular Dynamics in a D_{ho} Columnar Mesophase

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In this paper we report the first molecular dynamics study combining fast field-cycling and conventional NMR techniques in a thermotropic liquid crystal of discotic molecules exhibiting an ordered columnar hexagonal mesophase. Using the association of these techniques we obtained proton T_1 data over a very large domain of Larmor frequencies ($\omega/2\pi$ from 500 Hz to 85 MHz). The proton spin-lattice relaxation results were analysed considering the structure of the mesophase and the types of movements which are expected to influence significantly the relaxation rate, namely local molecular rotational reorientations, inter-columnar self-diffusion and collective movements corresponding to bending and compression of the columns. We verified that these mechanisms dominate the relaxation respectively for high, medium and low Larmor frequencies.

Key words: NMR; Proton Relaxation; Molecular Dynamics; Columnar Hexagonal Mesophases (D_{ho});
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