Biaxial nematic ordering and collective modes in a tetrapode liquid crystalline system observed by different DNMR methods

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Reports of the biaxial nematic phase in thermotropic liquid crystals have emerged recently from studies of new nematic compounds including bent-core systems, side-chain polymers, bent-core dimmers and organoxiloxane tetrapodes[1-3]. This phase, predicted more than 30 years ago[4], has remained elusive for reasons still under discussion that relate to the biaxial nematic phase destabilization towards more ordered layered structures at low temperatures[5]. Organosiloxane tetrapodes, having been shown by several experimental techniques to exhibit a biaxial nematic phase below a uniaxial nematic range[2,3], are the subject of this work. We report a comprehensive study using different DNMR techniques that combines recently published results[3] with data signal acquisition synchronized with the sample rotation, confirming the presence of biaxial ordering in the nematic phase of the compound TM35. The coherent analysis of all results is achieved by the inclusion of the collective modes contribution to the DNMR spectra at all temperatures analyzed. It is found in this study that the continuous rotation of our aligned sample for sufficient high speeds does not break the main director alignment. This condition permits the use of synchronized data acquisition in order to probe different director orientations relative to the external static magnetic field. This technique yielded more accurate measurements of the asymmetry parameter (linked to the phase biaxiality), supporting previously reported results on biaxial nematic ordering in the organosiloxane tetrapode TM35[3].

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