NMR and director dynamics in non-homogeneous nematics confined between parallel plates and subjected to orthogonal magnetic and electric fields

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The deuterium NMR lineshape in nematics can be accurately expressed in terms of the director orientation distribution in the sample. However, a given lineshape can be obtained from several distinct distributions, which means that for a consistent interpretation of the NMR data one needs to derive the appropriate director distribution from the (well established) Leslie-Ericksen theory or an equivalent model of the fluid mechanics. In this work, we investigate theoretically the director configuration and dynamics in low molecular weight nematic liquid crystal films confined between two parallel plates and subjected to orthogonal magnetic and electric fields. Our aim is to produce a clear interpretation of recent experimental NMR data [1] that challenge the usual description of the director dynamics [2]. We discuss several characteristics of real systems that might contribute to the observed behaviour, including local misalignments on the boundaries, residual disclinations and inversion walls (not annealed by the applied fields), and director fluctuations [3]. Orientation distribution functions that account for such non-homogeneities of the nematic director field are derived and the corresponding NMR spectra simulated.

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