Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Orientational order of an ideal rodlike nematic: Rewriting the theory of nematic liquid crystals? EDWARD SAMULSKI, LOUIS MADSEN, THEO DINGEMANS, University of North Carolina - Department of Chemistry — Order in rodlike nematic liquid crystals (LCs) represents a rich field described by myriad theories and studied using various analytical methods. We have made deuterium (D) NMR observations on the labeled para-quinquephenyl LC, which closely approximates a rigid rod. To investigate this high-melting nematic (range 390 - 427 deg. C), we have fabricated a high-efficiency oven on an NMR probehead using fumed silica tiles and utilizing only ambient air cooling. Observations on p-quinquephenyl clearly and drastically deviate from the Maier-Saupe theory and all other molecular theories of nematics, thus indicating the necessity for more a complete theory (e.g., including microscopic director fluctuations) to describe nematic order. We measure the complete order tensor for this LC using combinations of quadrupole and dipolar NMR coupling constants and different D label positions. We will discuss progress on refinements to nematic order theory, relations to NMR measurements, and fits using the phenomenological Landau-deGennes theory.

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Date submitted: 30 Nov 2005 Electronic form version 1.4