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Deuteron NMR Study of the Isotropic-Smectic A transition in Liquid-Crystal-Aerosil Dispersions[1] VISHAL PANDYA, DANIELE FINOTELLO, Department of Physics, Kent State University — In this work, we present a deuteron nuclear magnetic resonance (NMR) study of quenched disorder effects on the 12CB liquid crystal (LC) upon dispersion of silica nano particles (type A-300): hydrophilic silica spheres of diameter 7nm and surface area S=300m^2/g, with hydroxyl groups covering their surface. The LC-aerosil dispersions form a gel (network) if the aerosil density exceeds the gelation (percolation) threshold. The hydroxyl groups on the surface and the polar nature of the LC, likely yield a homeotropic alignment at the silica surfaces. For low densities of aerosil in the dispersions and while cooling the sample, the LC director in void volume is parallel to the external NMR field; a well defined and aligned LC configuration is established. When a complete silica network finally forms, if the dispersion orientation with respect to the NMR field is changed, a few silica links are broken by the field, re-aligning some LC molecules; effectively, the aerosil locks-in the LC configuration which exhibits a P_2 (CosΘ) dependence. The external field anneals the random disorder introduced by aerosil up to a certain density beyond which, disordering effects dominate; for aerosil densities exceeding $\rho_S \approx 0.055$ g/cm^{3}the NMR spectrum is a powder-pattern representing an isotropic distribution of smectic domains. The occurrence of quenching of 12CB Sm-A phase at $\rho_S \approx 0.055$ g/cm^3, is roughly one order of magnitude less than the density required for quenching of 8CB [1] [1] T. Jin and D. Finotello, *Phys. Rev.* **E 69**, 041704 (2004); *Phys. Rev Lett.* **86**, 818 (2001).

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