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Effect of CNTs and Induced Chirality on Smectic- Smectic Liquid Crystal Phase Transitions P. KALAKONDA, G.S. IANNACCHIONE, WPI, R. BASU, C. ROSENBLATT, CWRU, R.P. LEMIEUX, Queens U., CA — High-resolution calorimetry results are presented of carbon nanotubes (CNTs) and the liquid crystal (LC) 9OO4 nano-colloidal dispersions as a function of temperature, scan rate, and CNT concentration (0, 0.025, 0.05, 0.20 wt/%). The CNT used have an enantiomeric excess that has been shown to induce chirality into this LC. The pure LC exhibits the phase sequence I-N-SmA-SmC-SmB-Cr on cooling with the expected heat capacity C_p signatures, except for the SmA-SmC transition, manifesting a double-C_p peak ~ 2 K apart at low effective scan rates (< 0.5 K min^{-1}). The introduction of CNTs results in the I-N, N-SmA, and SmA-SmC double C_p features shifting to higher temperatures by ~ 1 K and remain sharp. However, the SmC-SmB and SmB-Cr transitions shift to lower temperatures by $\sim 3-4$ K and broaden dramatically with increasing CNT content. We interpret these observations as a consequence of the π-π interactions between the phenyl rings of 9OO4 and the graphene surfaces that induces bulk chirality, and the pinning of the director parallel to the CNT long-axis far from the surface. The balance of these two mechanisms may stabilize phases that lack any in-smectic-plane ordering.

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