Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Carbon nanotube-induced chirality and macroscopic helical twist in achiral liquid crystals RAJRATAN BASU, KRYSTA BOCCUZZI, SAMEH FERJANI, Case Western Reserve University, ROBERT LEMIEUX, Queen's University, ROLFE PETSCHEK, CHARLES ROSENBLATT, Case Western Reserve University — A small quantity of carbon nanotubes was dispersed in an achiral liquid crystal, and the mixture was found to exhibit a weak degree of chirality both in the smectic and nematic phases. The induced chirality in the LC was probed by means of the electroclinic effect in the liquid crystal's smectic-A and nematic phases, which showed significant pretransitional behavior on approaching the smectic-A – smectic-C and the nematic – smectic-A transition temperatures, respectively, from above. The carbon nanotubes also were found to induce a bulk twist over macroscopic dimensions in an achiral nematic matrix. The nanotube-induced chiral pitch length P was determined as a function of average nanotube concentration by measuring the radii of curvature of reverse twist disclination lines in 90° twist nematic cells. The results reveal information about the nanotubes' spatial distribution inside the cells. A concentration for the onset of significant aggregation of the nanotubes can be quantified from the apparent saturation of P^{-1} at higher concentrations. The macroscopic helical twisting power of the nanotubes has been estimated from the results. The results indicate that there is a net chirality associated with the carbon nanotubes, which is transmitted into the achiral liquid crystal.

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Date submitted: 05 Dec 2011 Electronic form version 1.4