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Dynamic Light Scattering on a Twist-Bend nematic Liquid Crystal ZEINAB PARSOUZI, SHAIKH SHAMID, VOLODYMYR BORSHCH, PAVAN CHALLA, Kent State University, GABRIELA TAMBA, GEORG MEHL, University of Hull, JAMES GLEESON, ANTAL JKLI, OLEG LAVRENTOVICH, DAVID ALLENDER, JONATHAN SELINGER, SAMUEL SPRUNT, Kent State University — We present a dynamic light scattering study performed on the uniaxial and twist-bend nematic (N_{TB}) phases of a liquid crystal dimer/monomer mixture. In the nematic phase, in addition to the usual two hydrodynamic director modes, the results reveal a single non-hydrodynamic process that is associated with fluctuations in orientational order in the plane perpendicular to the primary (uniaxial) ordering direction. On the other hand, data from the N_{TB} phase demonstrate a pair of non-hydrodynamic modes and a single hydrodynamic mode. The non-hydrodynamic modes are strongly temperature-dependent, slowing down as the transition is approached from the N_{TB} side. Our results may be explained by a Landau-deGennes expansion of free energy for the N to N_{TB} transition in terms of a helical polarization field, which is nonzero in the N_{TB} state and is coupled to the heliconical director that characterizes the N_{TB} state. The short pitch of the structure allows a "coarse-graining" of the free energy that accounts for the observed fluctuation mode structure and properties at optical wavevectors. In the model, the helical axis is the effective director, and the helical planes become smectic-like layers. We estimate an effective compression constant, B = 4000 Pa, for the N_{TB} "layer" structure.

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