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Flow Properties of a Twist-bend Nematic Liquid Crystal SEYYED MUHAMMAD SALILI, CHANJOONG KIM, Chemical Physics Interdisciplinary Program and Liquid Crystal Institute, Kent State University, Kent, OH 44242, SAMUEL SPRUNT, JAMES GLEESON, Department of Physics, Kent State University, Kent, OH 44242, OWAIN PARRI, Merck Chemicals Ltd., Chilworth Technical Centre, University Parkway, Southampton SO16 7QD, UK, ANTAL JAKLI, Chemical Physics Interdisciplinary Program and Liquid Crystal Institute, Kent State University, Kent, OH 44242, CHEMICAL PHYSICS INTERDISCIPLINARY PROGRAM AND LIQUID CRYSTAL INSTITUTE, KENT STATE UNIVERSITY COLLABORATION, DEPARTMENT OF PHYSICS, KENT STATE UNIVERSITY COLLABORATION, MERCK CHEMICALS LTD. COLLABORATION
— We present the first shear alignment studies and rheological measurements in the twist-bend nematic (N_{tb}) liquid crystal phase of odd numbered flexible dimer molecules. It is found that the N_{tb} phase is strongly shear-thinning. At shear stresses below $1Pa$ the apparent viscosity of N_{tb} is 1000 times larger than in the nematic phase. At stress above $10Pa$ the N_{tb} viscosity drops by two orders of magnitude and the material exhibits Newtonian fluid behavior. This is consistent with the heliconic axis becoming normal to the shear plane via shear-induced alignment. From measurements of the dynamic modulus we estimate the compression modulus of the pseudo-layers to be $B \sim 2kPa$; this value is discussed within the context of a simple theoretical model based upon a coarse-grained elastic free energy.

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