Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Rheology 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, USA, SAMUEL SPRUNT, JAMES GLEESON, Department of Physics, Kent State University, Kent, OH 44242, USA, 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, USA, JAKLI LAB TEAM[1], KIM LAB TEAM, MERCK LAB TEAM — First detailed flow shear alignment studies and rheological measurements in the twist-bend nematic (N_{tb}) liquid crystalline phase of odd numbered flexible dimer molecules is presented. It is found that the N_{tb} phase is strongly shear-thinning. At shear stresses below $1Pa$ the apparent viscosity of the N_{tb} phase is 1000 times larger than in the nematic phase. At stresses above $10Pa$ the N_{tb} viscosity drops by two orders of magnitude and the material exhibits Newtonian fluid behavior. The results are consistent with the behavior of a system with pseudo-layer structure with layer spacing determined by the heliconical pitch. From the measurements of 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.

[1]www.jakligroup.com

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Date submitted: 14 Nov 2014 Electronic form version 1.4