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The B4 phase: layer curvature driven by frustrated intralayer packing L.E. HOUGH, LCMRC, Physics Dept., CU Boulder , D. KRUERKE, Institute of Inorganic and Analytical Chemistry, TU of Berlin, C.D. JONES, LCMRC, Physics Dept., CU Boulder , H.T. JUNG, J. ZASADZINSKI, Dept. of Chemical Engineering, UCSB, G. HEPPKE, Institute of Inorganic and Analytical Chemistry, TU of Berlin, J. RABE, W. STOCKER, Institute for Physics, Humboldt U. Berlin, E. KORBLOVA, D. WALBA, LCMRC, Dept of Chemistry and Biochemistry, CU Boulder, N.A. CLARK, LCMRC, Physics Dept., CU Boulder — We combine freeze fracture transmission electron microscopy, atomic force microscopy, and x-ray diffraction to show that the B4 phase is a smectic phase with highly curved layers (mean radius $\sim$ 4 layer spacings). The layer structure of the phase is a TGB-like phase made up of parallel arrays of multiple burgers vector screw dislocations (grain boundaries) giving 45 degree rotations across the grain boundaries. Models of the layer structure are based on periodic arrays of grain boundaries, each described by Scherk's first surface, and yield key features of the observed structures. This layered structure is dominated by saddle splay and we propose that the energy cost of defects required to make such a structure is offset by an energy gain of the layer curvature. We show that analysis of the wide angle x-ray diffraction of this phase indicates that layer curvature relieves the intralayer frustration produced by the packing of bent-core molecules. This work is supported by a NSF GRF and by NSF MRSEC Grant DMR0213918.

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