Supporting Information

Indication of a Twist-Grain-Boundary-Twist-Bend Phase of Flexible Core Bent-shape Chiral Dimers

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Molecular structure of the studied materials:

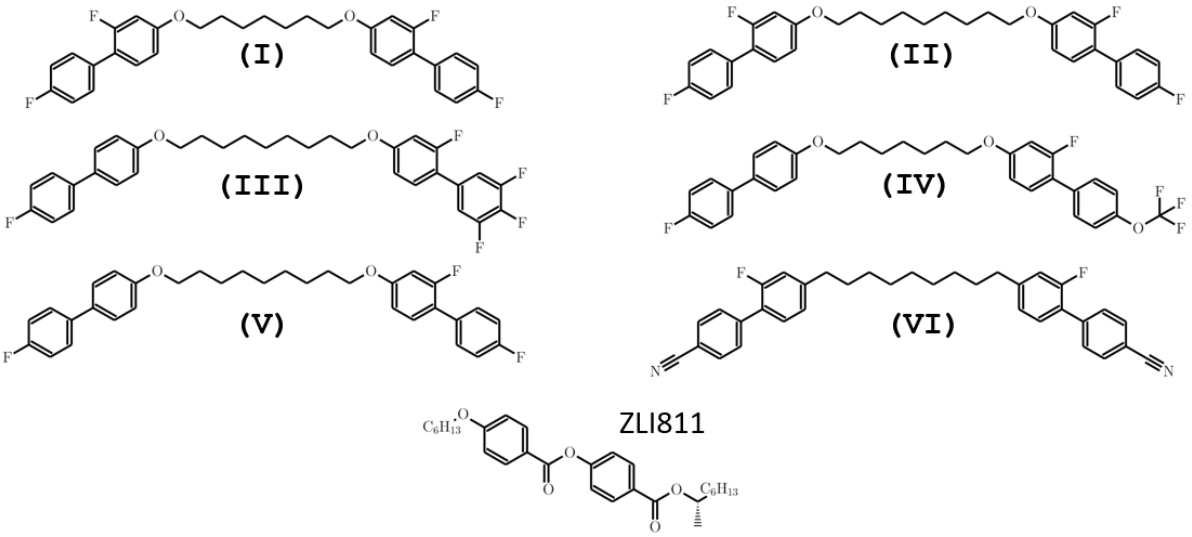

Figure S1: Molecular structures of the constituents of studied mixtures. KA(0.2) [i – vi] and chiral dopant ZLI811. The 6-component mixture of achiral dimers KA(0.2) exhibits N_{TB} phase upon cooling below the uniaxial nematic.

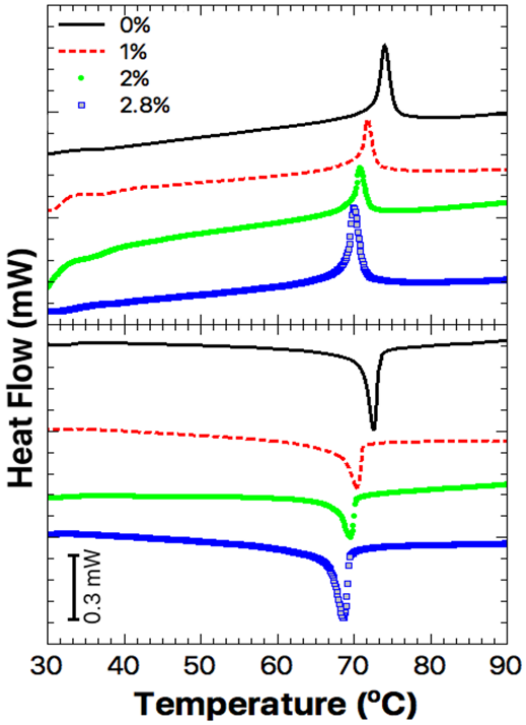

Figure S2: Differential scanning calorimetry (DSC) curves in heating (top) and cooling with 5°C/min rates.

	0%	**1%**	**2%**	**2.8%**
$T_{N\text{-}I}$ (°C)/ ΔH(J/g)	74.08 (2.4)	71.84 (2.3)	70.82 (1.9)	69.90 (2.2)
$T_{I\text{-}N}$ (°C)/ ΔH(J/g)	72.71 (2.5)	70.42 (2.4)	69.50 (2.3)	68.46 (2.3)

Table S1: Enthalpy of fusion measured by DSC in heating (top) and cooling(bottom).

The N-N_{TB} transition of KA(0.2) and their mixtures with chiral additives are nearly of second order and our DSC was not sensitive to measure the enthalpy at this transition. Note that previous DSC measurements on several twist-bend nematogens have reported $\frac{\Delta H_{I-N}}{\Delta H_{N-N_{TB}}} > 20$ [1] and $2 \leq \frac{\Delta H_{I-N}}{\Delta H_{N-N_{TB}}} \leq 50$ [2].

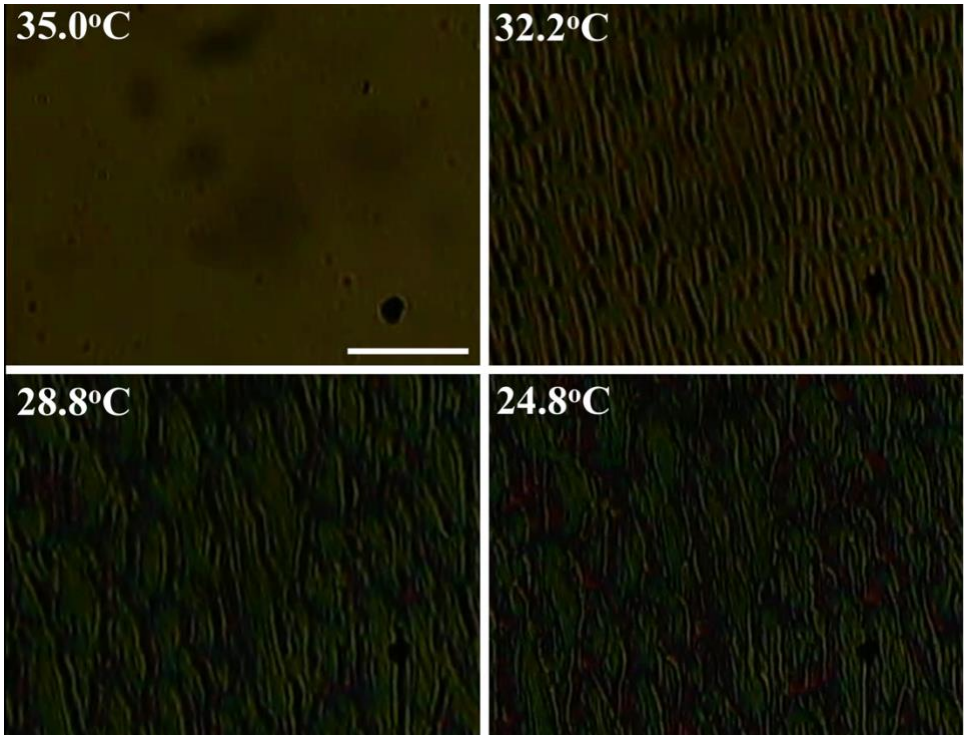

Figure S3: Typical textures seen in Polarized Optical Microscopy (POM) of 5µm thick film of KA(0.2) +1% ZLI811 at different temperatures. Bar shows 50µm length.

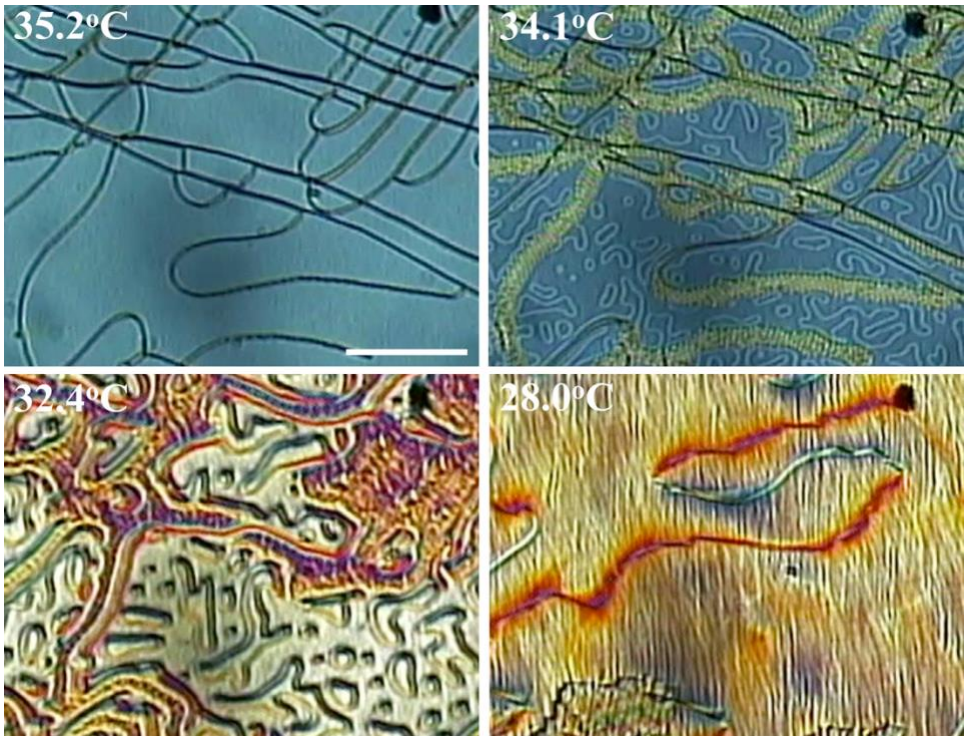

Figure S4:: Typical textures seen in Polarized Optical Microscopy (POM) of 5µm thick film of KA(0.2) +2.5 % ZLI811 at different temperatures. Bar shows 50µm length.

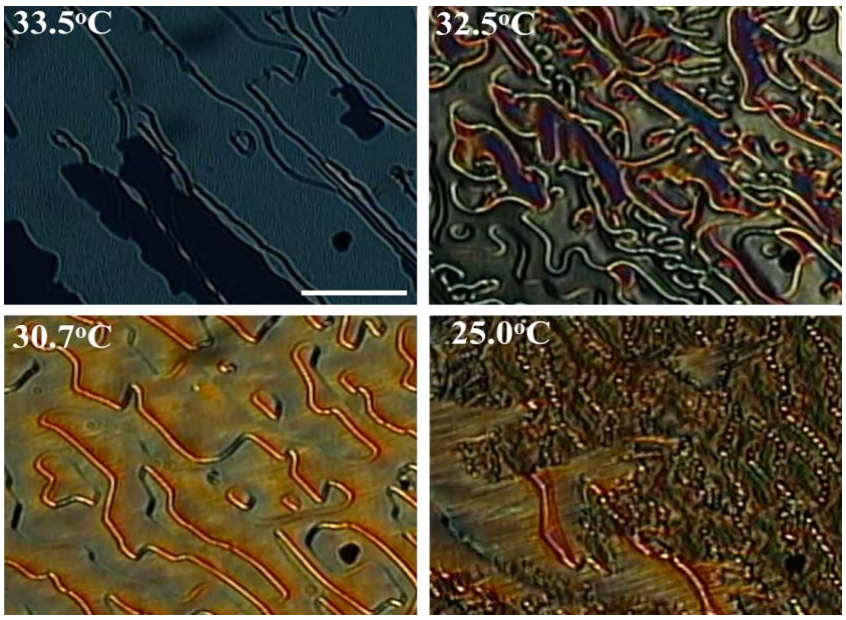

Figure S5: Typical textures seen in Polarized Optical Microscopy (POM) of 5µm thick film of KA(0.2) +3,5 % ZLI811 at different temperatures. Bar shows 50µm length.

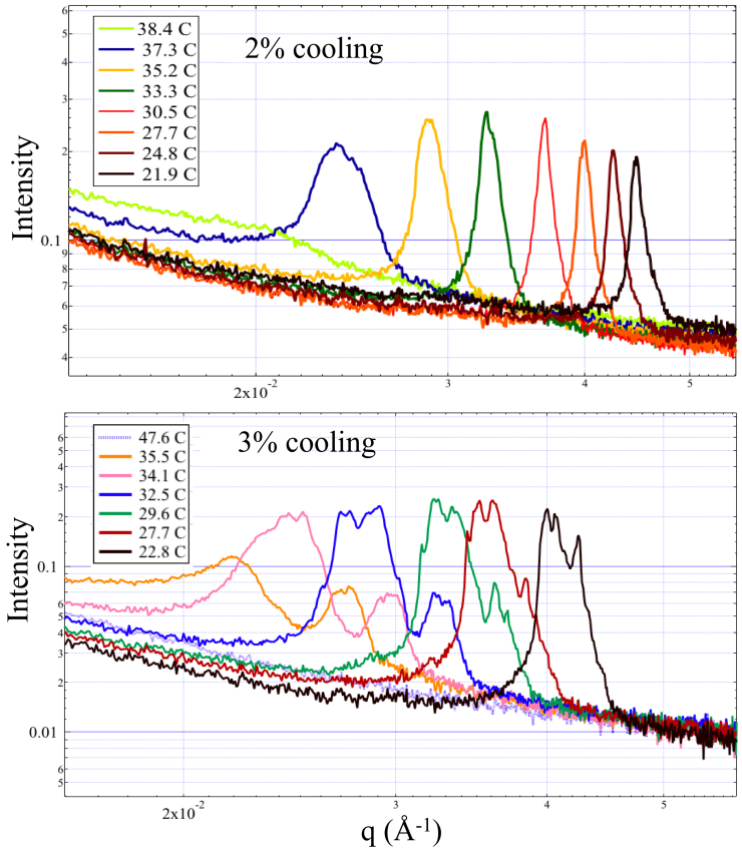

Figure S6: Intensity of RSoXS signals at the function of wavenumber q at 2% (top) and 3% ZLI811 concentrations.

With increasing chiral additive concentration the signal RSoXS exhibits a dramatic splitting which does not appear until 3% mixture. This may be interpreted as frustration in the twist-bend helix where by chiral additive ZLI811 fits favorably into helix of a single handedness causing the mirrored helix to extend to enable the chiral additive to be incorporated.

References:

1 D. A. Paterson, J. Xiang, G. Singh, R. Walker, M. Agra-Kooijman, A. Martínez-Felipe, M. Gao, J. M. D Storey, S. Kumar, O. D. Lavrentovich and C. T. Imrie, , DOI:10.1021/jacs.5b13331.

2 C. T. Archbold, R. J. Mandle, J. L. Andrews, S. J. Cowling and J. W. Goodby, *Liq. Cryst.*, 2017, **44**, 1–10.