

Phase Behavior of Binary Mixtures of NOBOW/8CB

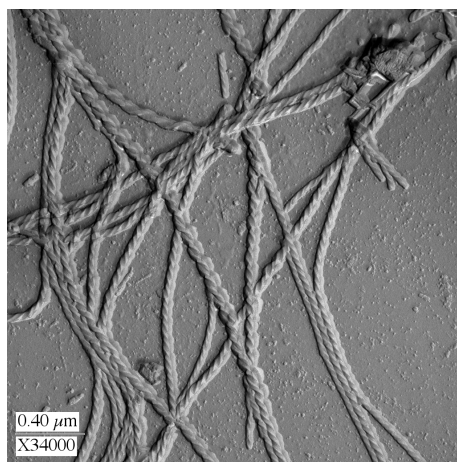
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The bent core mesogen NOBOW is one of several bent-core molecules forming the B4, a low temperature phase exhibiting large chiral domains, low birefringence and optical rotation. Recently it has been demonstrated that this phase is formed by hexatic helical nano-filaments (figure below), the structure of which is determined by the intrinsic tendency for bent-core layers to adopt saddle splay curvature [1]. In neat NOBOW these filaments nearly fill space to form a nanoporous twist grain boundary-like structure. Here we report on the structure of mixtures of NOBOW with the calamitic liquid crystal 8CB, wherein the NOBOW concentration c ranges from $11\% < c < 70\%$. Freeze-fracture TEM observation of the B4 structure, x-ray diffraction, and optical microscopy reveal the following about these mixtures: (i) complete nanophase separation of the NOBOW and 8CB components, with essentially pure NOBOW appearing as nano-filaments nearly identical to those of the neat NOBOW and essentially pure 8CB filling the spaces between the B4 nano-filaments. (ii) The NOBOW B2 and B3 phases disappear at low 8CB concentrations and the I-B4 transition exhibits freezing point depression according Raoult' law. (iii) X-ray diffraction shows that the correlation length of 8CB between the B4 nano-filaments decreases significantly as c increases. (* This work is supported by NSF MRSEC Grant DMR0213918.)

Reference:

[1] N. A. Clark, L. E. Hough, M.-S. Heberling, M. Spannuth, M. Nakata, M. Glaser, D. Krüerke, C. D. Jones, G. Heppke, H. Jung, J. Zasadzinski, J. Rabe, W. Stocker, E. Korblova, and D. Walba, "The B4 and the Thermotropic Sponge: Topologically Disordered Liquid Crystal Phases Stabilized by Frustrated Intralayer Correlations", 11th International Conference on Ferroelectric Liquid Crystals, Sapporo, Japan, 2007.



Freeze-fracture image of 75% 8CB/NOBOW mixture.