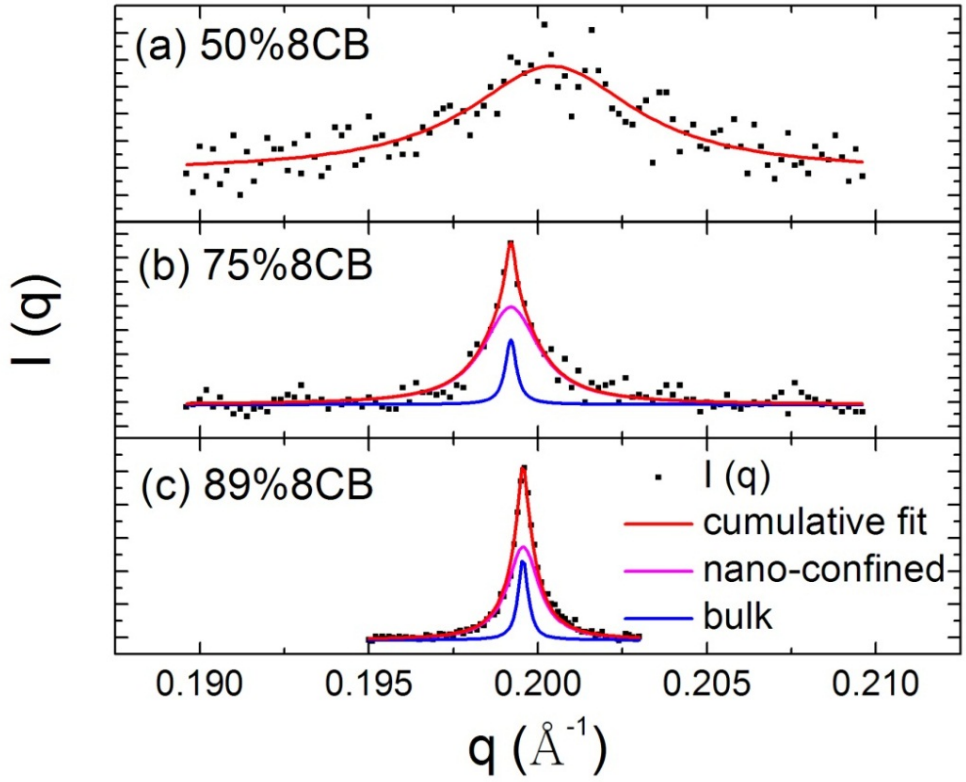
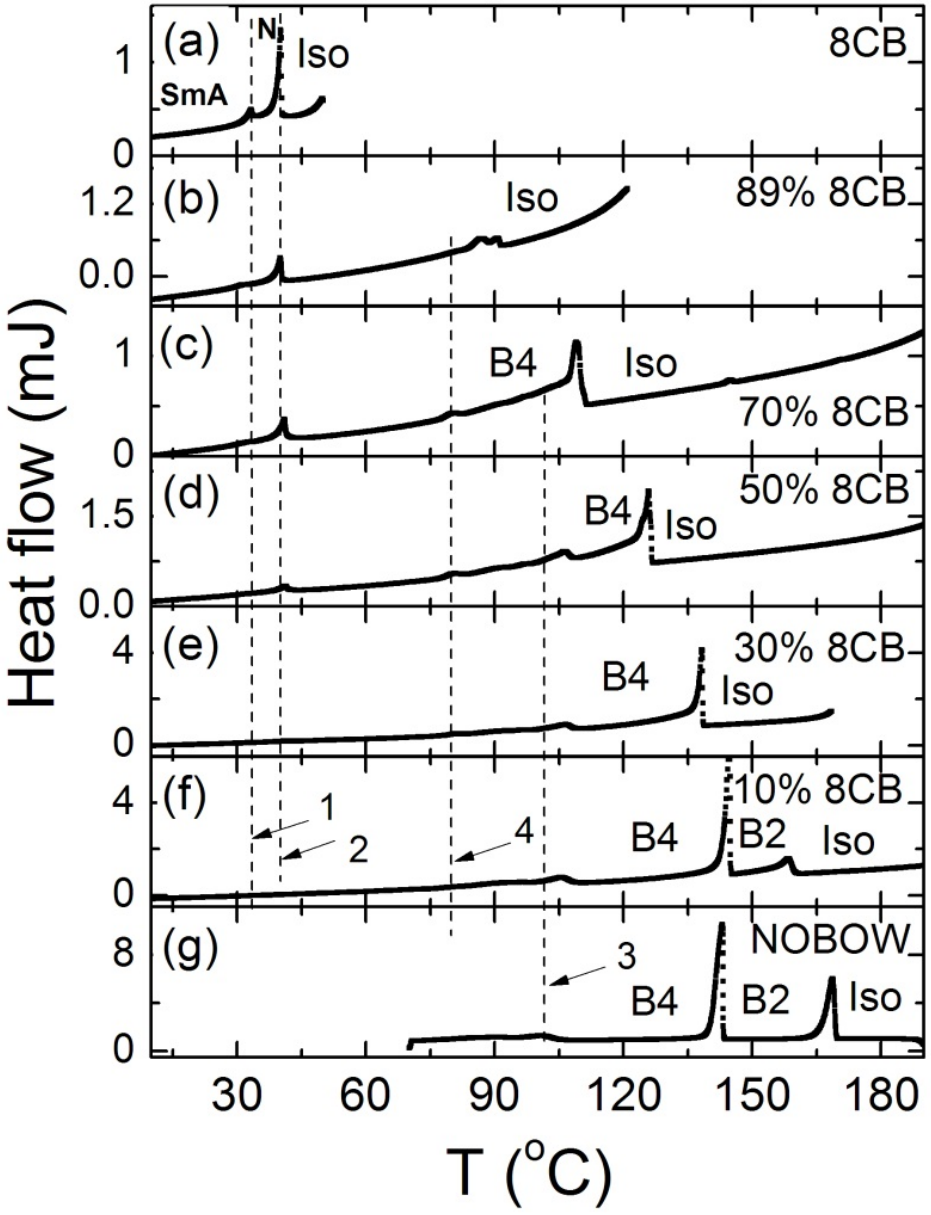
Supporting Information for Nanoconfinement of Guest Materials by Helical Nanofilament Networks of Bent-Core Mesogens

Dong Chen[a], Chenhui Zhu[a], Haitao Wang[a,b], Joseph E. Maclennan[a], Matthew A. Glaser[a], Eva Korblova[c], David M. Walba[c], James A. Rego[d], Eduardo A. Soto-Bustamante[e], and Noel A. Clark[a*]

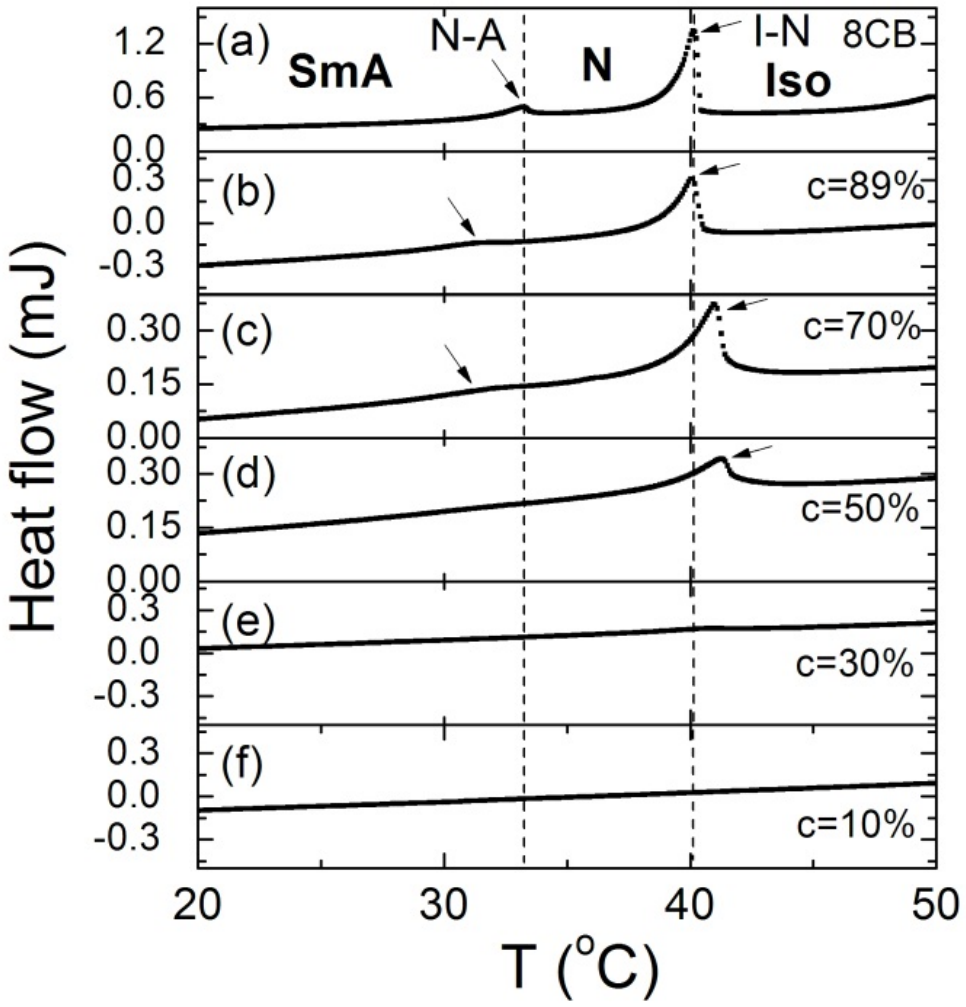
[a]Department of Physics and Liquid Crystal Materials Research Center, University of Colorado, Boulder, CO 80309-0390, USA.
[b]Key Laboratory of Automobile Materials (MOE) & College of Materials Science and Engineering, Jilin University, Changchun 130012, China.
[c]Dept. of Chemistry and Biochemistry and Liquid Crystal Materials Research Center, University of Colorado, Boulder, CO 80309-0215, USA.
[d]Department of Chemistry, California State Polytechnic University, Pomona, CA 91768, USA.
[e]Universidad de Chile, Facultad de Ciencias Químicas y Farmacias, Olivos 1007, Casilla 233, Santiago 1, Chile.
*Email: Noel.Clark@colorado.edu



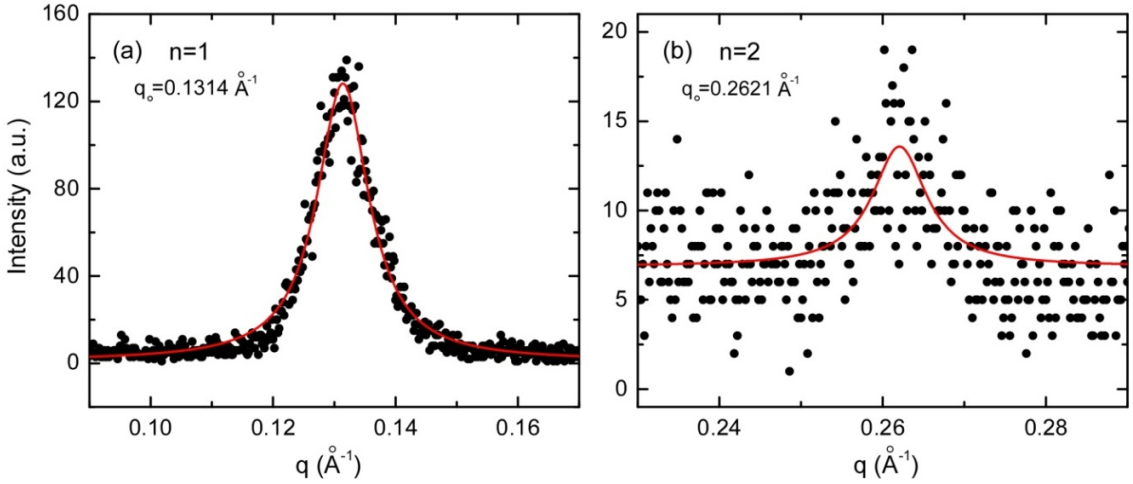
S.1: 8CB SmA peak for (a) c=50%, (b) 75%, and (c) 89% [1]. The raw data were fit with two subpeaks: (1) the blue curve corresponding to the bulk 8CB and (2) the magenta curve corresponding to the nanoconfined 8CB. For c≤50%, there was no detectable contribution to the scattering from bulk 8CB. As c increases, the bulk 8CB signal grows, as evidenced by the area under the blue curve.



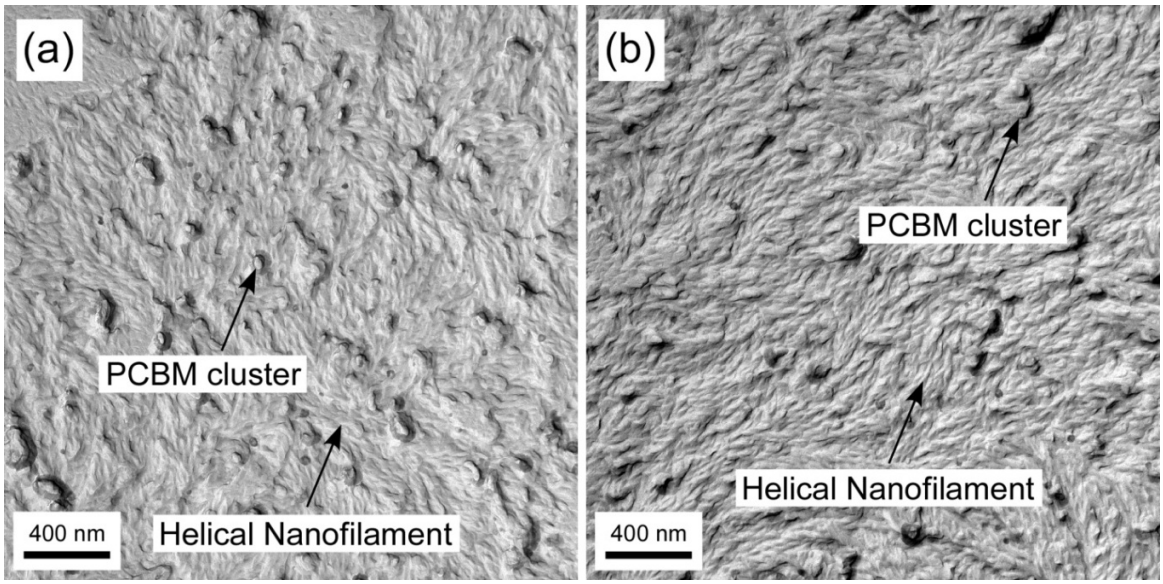
S.2: DSC scans of 8CB/NOBOW mixtures (c=10%, 30%, 50%, 70% and 89%), neat 8CB, and neat NOBOW obtained on cooling [1]. Dashed lines 1, 2, and 3 mark the neat 8CB N–SmA transition, the neat 8CB Iso–N transition, and the neat NOBOW B4 glass transition, respectively. Dashed line 4 marks the pre-alignment of 8CB by NOBOW B4 helical nanofilament in the mixture. As the 8CB concentration increases, the transition temperature of NOBOW Iso–B2 transition and Iso–B4 transition decreases due to freezing-point depression. The 8CB nematic range is observed to broaden slightly as the NOBOW concentration increases (see S. 3 for an enlarged view).



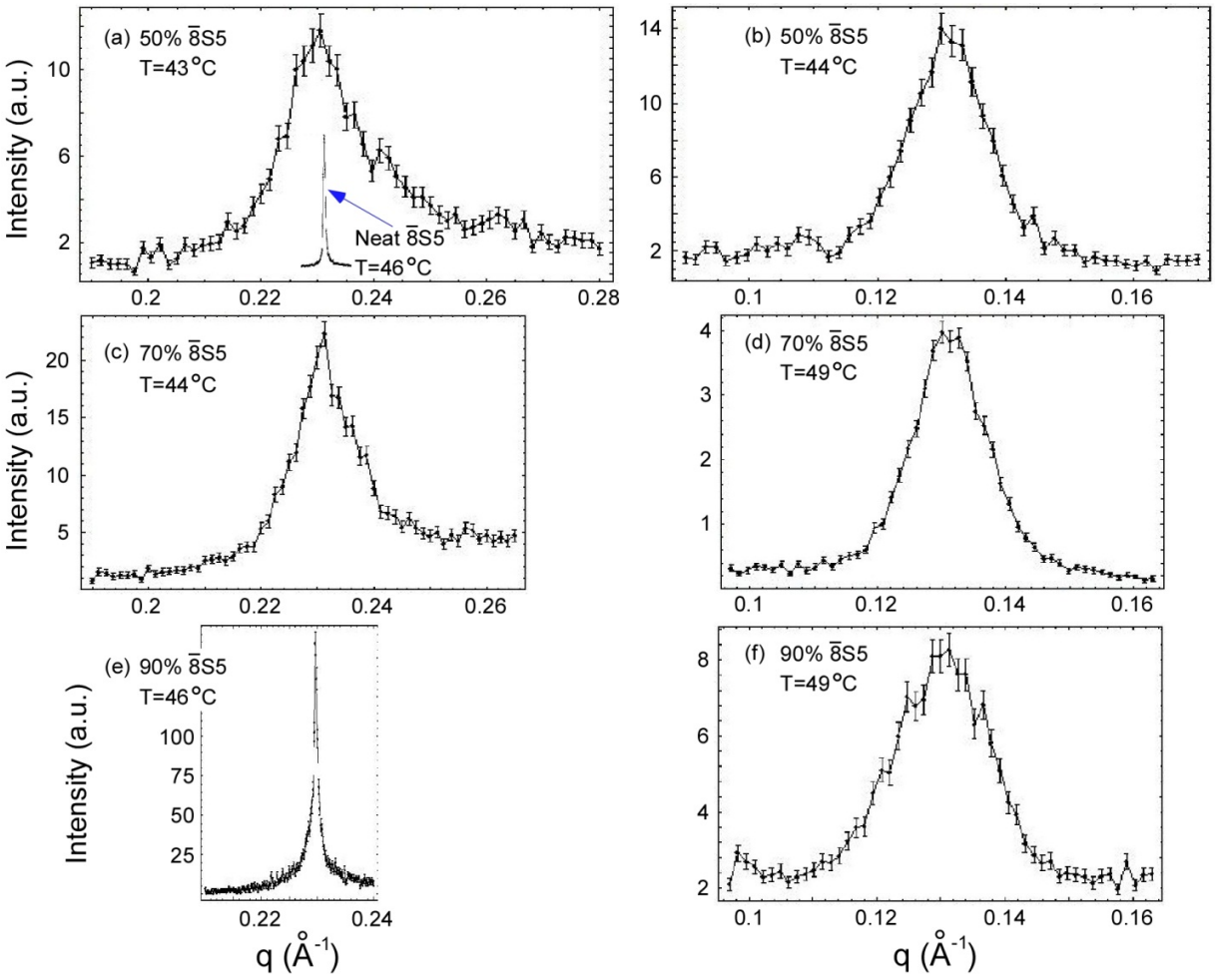
S.3: DSC of 8CB/NOBOW mixtures and neat 8CB near room temperature [1]. Dashed lines mark the neat 8CB Iso–N and N–SmA transitions. The transitions in the mixtures are indicated with arrows. As the 8CB concentration decreases, the Iso–N transition temperature increases while the N–SmA transition temperature decreases, slightly broadening the 8CB nematic range.



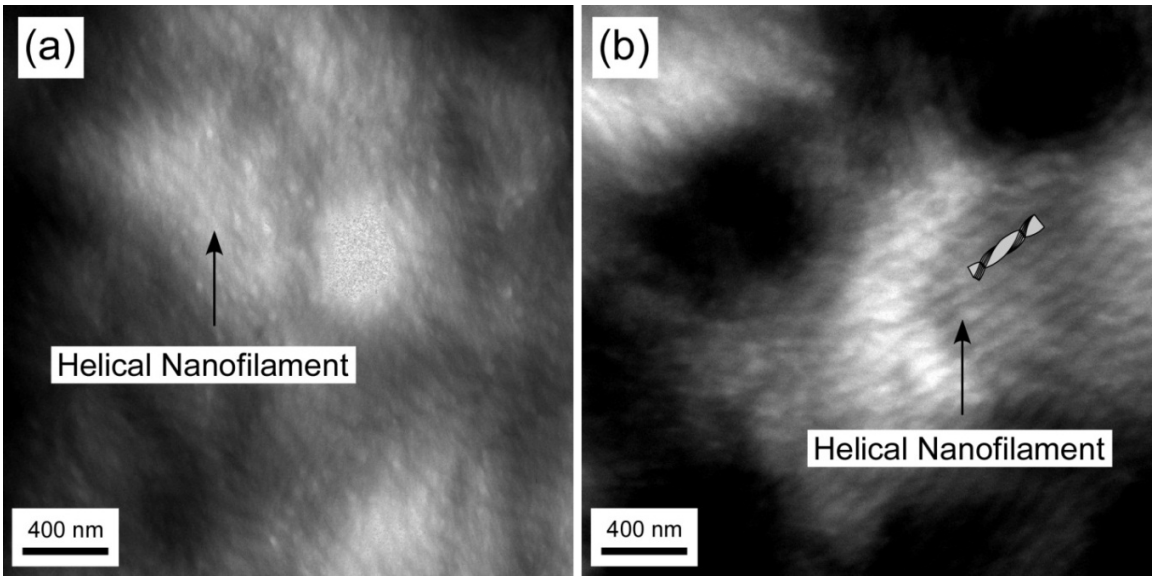
S.4: X-ray diffraction from B4 helical nanofilaments in a c=51% PM6R8-90/NOBOW mixture at T=69°C. (a) and (b) show the first and second harmonics of the Bragg scattering from the smectic layers.



S.5: FFTEM images of a c=5% PCBM/NOBOW mixture, quenched at T=90°C and then fractured in the bulk. At low temperature, NOBOW and PCMB are essentially immiscible. NOBOW self-assembles into helical nanofilaments while PCMB aggregates into clusters around 100 nm in size.



S.6: 8̄S5 SmC layer diffraction peak for (a) c=50%, (c) 70%, and (e) 90%, and NOBOW B4 peak for (b) c=50%, (d) 70%, and (f) 90%. No bulk contribution of the 8̄S5 SmC phase is observed for c<70%. The NOBOW B4 peak is essentially the same as that measured in neat NOBOW for all mixtures.



S.7: TEM images of NOBOW B4 helical nanofilaments. A droplet of the isotropic blend of a c=99.994% hexadecane/NOBOW mixture at T=70°C is placed onto Formvar. The sample is then cooled to room temperature, where the B4 nanofilaments phase-separate from the isotropic solution. Once the hexadecane evaporates, the helical nanofilaments can be visualized directly using TEM.

Reference:

[1] C. Zhu, D. Chen, Y. Shen, C. D. Jones, M. A. Glaser, J. E. Maclennan, N. A. Clark, *Phys. Rev. E* **2010**, *81*, 011704.