Orientation of a Helical Nanofilament (B4) Liquid-Crystal Phase

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We have shown that topographic channel confinement can produce well-oriented domains of the helical nanofilaments of the B4 phase of several bent-core materials, but only if used in conjunction with air-flow-induced shear alignment. In this combination, the role of the topographic patterning of the surface is generalized beyond simply providing proximate aligning surfaces. The topography limits the gross flow of the LC, keeping it in the channels and controlling the LC circulation in the presence of the driving air flux. The topography combined with the high thermal conductivity of the confining patterned substrate controls where LC will first appear upon cooling. Thus, the success of this combination is based on the topography also controlling both temperature gradients and shear flow in the sample to be aligned. The achievement of alignment of the B4, notoriously difficult to orient with other methods, shows that the use of topographic confinement to control effects such as flow and gradients may prove to be a powerful combination in the use of LCs in applications beyond displays, where systems that are attractive are often difficult to align, for example in organic electronics.