Bent-core mesogens and complex density modulated structures

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It is truly fascinating that rather simple modification of molecular structure such as bending the mesogenic core, resulted in large number of new liquid crystalline phases that were not observed neither for rod-like nor for disc-like materials. Apart from uniaxial and biaxial nematic (the question does N_b really exist? will be addressed), smectic and hexagonal columnar phases, bent core molecules tend to form variety of complex 2-D density modulated structures.
There are two general types of density modulated structures recognized in x-ray studies:

- the layers are broken and more or less pronounced blocks of molecules are formed (B1-type phases).
- for the general smectic C (SmC_G) phase, having molecular mass centers shifted from the layer mid-plane, 2-D density modulated structure is obtained due to the space modulation of the mass centers positions in the layers.

We show that these two type periodic structures can exist for the same material in the different temperature regions but also, in rare cases, both incommensurate modulations are superimposed and co-exist in the same temperature window.

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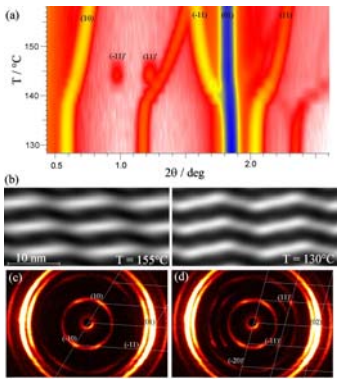

(a) Temperature evolution of the low angle x-ray signals for bent-core compound**.** (b) Electron density maps obtained from the x-ray data in two B_{1Rev}-type phases. (c) The small angle region of x-ray patterns for partially aligned sample registered at (c) 150 °C in B_{1rev} phase (note, that indexing scheme is based on primitive unit cell) and (d) 145 °C in which two incommensurate crystallographic lattices for the columnar B_{1rev} phase and modulated bilayer SmC_G co-exist. For clarity in this pattern only the lattice for the modulated bilayer SmC_G was drawn.