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Pretransitional Clusters in Multicolor Liquid Crystalline Honeycombs[1] GORAN UNGAR, XIANGBING ZENG, FENG LIU, Dept. Materials Sci. Eng., University of Sheffield, Sheffield, UK, ROBERT KIEFFER, CONSTANCE NÜRNBERGER, CARSTEN TSCHIERSKE, Institute of Organic Chemistry, Martin Luther University, Halle, Germany, GILLIAN GEHRING, Dept. Physics & Astronomy, University of Sheffield, Sheffield, UK — X-shaped tetraphilic molecules consisting of a rod-like core with two hydrogen-bonding terminal groups and two mutually incompatible side-chains A and B form a range of honeycomb-like structures in which the rods act as bricks in the walls of polygonal cylinder cells containing the fluid side-chains. Some of these systems exhibit a 2nd-order transition from the high-temperature mixed ("1-color") phase to a low-temperature phase in which the side-chains are separated in A and B cells ("2-color"). This is the situation with triangular, rectangular and square honeycombs. Strong pre-transitional 2-color domains formation is observed above the transition temperature. Particularly interesting is the case of the hexagonal honeycomb, where no fully phase-separated ground state can exist. Here the 2-color "ordered" phase consists of [A] cells and [A(1/4)B(3/4)] cells. The situation is similar to frustrated ferro- and antiferromagnets on a kagome lattice. Instead of the spins flipping, it is the molecules that undergo 180 degree rotations about the axis of their rod-like cores [Science 331, 1302 (2011)].

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