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X-Ray Determination of the Structure and Phases of Liquid Crystals of Nanoscale Duplex DNA MICHI NAKATA, U. of Colorado, GIULIANO ZANCHETTA, U. of Milano (IT), CHRISTOPHER JONES, U. of Colorado, BRANDON CHAPMAN, Brookhaven National Lab., RONALD PINDAK, Brookhaven National Lab., TOMMASO BELLINI, U. of Milano, NOEL CLARK, U. of Colorado —
Polymeric DNA chains are known to exhibit chiral nematic and hexagonal columnar LC phases. Recently we found that even very short duplex B-DNA oligomers 6-basepairs (bp) to 16-bp in length also form nematic and columnar phases depending on the concentration of DNA. To investigate the structure of those phases, we used micro-beam x-ray diffraction (10 micron spot size), enabling the study of single LC domains. In the columnar phases of 8bp, 12bp and 16bp all shows reflection spots corresponding to $20/AA$ which almost the same length scale of the width of DNA double helix. By selecting a proper orientation of the domains the diffraction pattern shows a hexagonal packing of columns of spacing which does not depend on the length of the basepair. On the other hand, there is no clear diffraction in the chiral nematic phase, which indicates that there is no significant highly ordered molecular aggregation. Those data indicate that short oligomers stack end- to end to form flexible rod-shaped DNA aggregates can then form LC phases. Work supported by NSF MRSEC Grant DMR 0213918 and NSF Grant 0072989.

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