

Evidence for a hexatic columnar mesophase in dense states of rod-like viruses

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We report a study of colloidal suspensions of highly monodisperse semiflexible chiral rod-like viruses in the range of high concentrations. Small angle x-ray scattering experiments reveal the existence of two hexagonal phases: the first one is crystalline and the second one is hexatic columnar, as shown by its short-range positional order (1). The occurrence of hexatic organization would stem from a geometrical frustration induced by the competition between long-range two-dimensional translational order and helical twist due the chirality of the virus (2,3). The suspension of rodlike viruses is thus the first experimental system showing the whole phase sequence with increasing particle concentration theoretically predicted for systems of hard rods, ranging from the chiral nematic via the smectic to columnar and crystalline phases.

References:

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Figure: X-ray scattering pattern of a columnar monodomain exhibiting a six-fold symmetry.



