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A Model Liquid Crystalline System Based on Rodlike Viruses with Tunable Chirality DANIEL BELLER, EDWARD BARRY, ZVONIMIR DOGIC, Brandeis University — Filamentous bacteriophages such as the *fd* virus have long been used as ideal model systems to investigate the phase behavior of suspensions of rodlike particles. We study the structure and phase behavior of a mutant, *fd* Y21M, and compare them to the properties of conventional *fd* wild-type (*wt*). These two viruses exhibit dramatically different phase behavior despite differing only by a single amino acid of the major coat protein pVIII. We find that this is attributable to significant differences in the flexibility of the viruses. Using the more rigid *fd* Y21M, we are able for the first time to quantitatively test the Onsager description of the isotropic-nematic phase transition of rigid rods. Even more surprising are the differences in the behavior of the cholesteric phase of *fd* Y21M and *fd wt*. While *fd wt* forms a cholesteric pitch with a left-handed helix, *fd* Y21M forms a cholesteric pitch with the opposite handedness. In addition, the magnitude of the cholesteric pitch changes by almost fivefold. Using mixtures of the two viruses, we are able to create liquid crystal systems with tunable control over the macroscopic chiral behavior.

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