

Abstract Submitted
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Nano-dumbbells pack densely to form birefringent photonic crystals JASON FORSTER, JIN-GYU PARK, Yale, MANISH MITTAL, University of Delaware, VINODKUMAR SARANATHAN, HEESO NOH, CARL SCHRECK, RICHARD PRUM, COREY O'HERN, HUI CAO, Yale, ERIC FURST, University of Delaware, ERIC DUFRESNE, Yale — Monodisperse spherical colloidal particles robustly self-assemble into crystals at high concentration. We study the self-assembly of polymer nano-dumbbells and find that they crystallize only under strong confinement - in thin films less than three particles thick. On the other hand, external electric fields can readily align dumbbell-shaped particles to make a birefringent suspension. When the electric field is turned off, the dumbbells rapidly lose their orientational order and the birefringence quickly goes away. However, if the solvent is removed with the electric field on, the particles self-assemble into a novel dense crystalline packing hundreds of particles thick. We describe the essential physics of self-assembly of these structures through an interplay of the applied electric field and capillary forces.

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