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Topological defects and self-assembly of cuboidal colloidal particles with sharp edges in a nematic liquid crystal. JUAN J. DE PABLO, MONIROSADAT SADATI, JULIO C. ARMAS-PEREZ, The University of Chicago, Institute for Molecular Engineering, VISHAL SONI, WILLIAM T. M. IRVINE, The University of Chicago, James Franck institute — The geometry of colloidal particles defines the topology and self-assembly of colloidal superstructures in nematic liquid crystals. Past research has largely focused on the defects that arise around spherical colloids, and the defect-induced aggregation between them. In this work, we examine experimentally and theoretically, the effect of edge curvature of colloidal particles on their defect configurations and self-assembly in a nematic liquid crystal (5CB). The polarized images of the particles with homeotropic surface anchoring in 5CB show that the presence of sharp edges can reshape completely the defect ring. The defect makes sharp turns and follows the edge of the cube particles, which significantly affects the interaction between particles and their eventual self-assembly. In agreement with our experimental results, our computational studies indicate that the gradual increase of the edges sharpness that occurs as we transition from spheres to cubes, changes the defect structure from a Saturn ring to a twisted ring, which is pinned to the edges of the cube particle. The wide variety of topological defects achievable by changing the curvature could provide new tools to tune colloidal self-assembly.

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