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Temperature Dependence of Topological Defect in the Twist-Bend Nematic Liquid Crystal Droplets Dispersed in Isotropic Fluid
GRETA CUKROV, YOUNG-KI KIM, OLEG D. LAVRENTOVICH, Liquid Crystal Institute and Chemical Physics Interdisciplinary Program, Kent State University, Kent, OH 44240, USA — We investigate the temperature dependence of topological defect in the liquid crystal droplets exhibiting nematic (N) and underlying twist-bend nematic (N_{tb}) phases with a use of polarizing optical microscopy. In this study, we adopt two surface anchoring boundary conditions: 1) tangential (director $\hat{\mathbf{n}}$ is parallel to the droplet's surface) and 2) homeotropic ($\hat{\mathbf{n}}$ is perpendicular to the droplet's surface). In N phase of the studied material, the droplets with a tangential anchoring possess two point defects, boojums, of strength 1 at the poles, while the ones under a homeotropic condition show a point defect, hedgehog, of strength 1 at the center of the droplets. These defects are normal topological features in the nematic phase. As the temperature T approaches the N - N_{tb} transition temperature ($T_{N\text{-}Ntb}$), however, the hedgehog in the droplets with a homeotropic anchoring splits into two point defects. As T is lowered further, the split defects move toward the poles of the droplet and are eventually located at poles in the N_{tb} phase. We ascribe the transition to the significant drop of the bend elastic constant K_3 near $T_{N\text{-}Ntb}$. Further experiments are in progress to verify how the intriguing features of the elastic constant in the N_{tb} phase affect the director configuration and topological behavior in the droplets.

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