Defects of chiral lyotropic chromonic liquid crystals in a cylindrical cavity

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The nematic lyotropic chromonic liquid crystals (LCLCs) show a doubly-twisted (DT) configuration when confined in a cylindrical cavity with a degenerate planar anchoring condition. This DT structure appears because LCLCs have a very small twist modulus and a very large saddle-splay modulus, compared to typical thermotropic LCs. Because the DT structure can have either right- or left-handedness with the same energy, domains of different handednesses coexist in one sample; a domain wall-like defect should appear at the interface between two hetero-chiral domains. In this work, we focus on how chiral dopants affect the defects of LCLCs in a capillary. We expectedly find the domain-wall like defects without chiral dopants. When the chiral dopants concentration is high enough, the homo-chiral configurations with no defects show up. Interestingly, we observe unexpected defects as we increase the dopant concentrations. Introducing the elastic free energy model of chiral LCLCs confined in a cylindrical cavity, we propose that these unexpected defects connect the domains with different helical pitches.