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Pattern Formation from Instabilities in Chromonic Liquid Crystals IRMGARD BISCHOFBERGER, QING ZHANG, MIT, SHUANG ZHOU, UMass Amherst — The displacement of a more viscous fluid by a less viscous one in a quasi-two dimensional geometry leads to the formation of complex fingering patterns. In isotropic systems, disordered dense-branching morphologies arise from repeated tip-splitting of the evolving finger. In anisotropic systems, by contrast, the growth morphology changes to a highly ordered dendritic growth characterized by stable needle-like protrusions decorated with regular side-branches. We investigate such morphology transitions between dendritic growth and dense-branching growth in an intrinsically anisotropic liquid; a lyotropic chromonic liquid crystal in the nematic phase. We show that the transition is remarkably sensitive to the interface velocity and the viscosity ratio between the less-viscous inner fluid and the more-viscous outer liquid crystal. We discuss the importance of a stable shear alignment of the liquid crystal in governing the morphology transition to dendritic growth.

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