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Network and cellular pattern formation in a phase-separating lyotropic liquid crystal YASUTAKA IWASHITA, HAJIME TANAKA, Institute of Industrial Science, University of Tokyo — Phase separation is the most fundamental physical phenomenon that produces various heterogeneous structures. Here we study a phase separation of lyotropic liquid crystal into ordered (lamellar) and disordered (sponge) phases. We found two types of novel pattern formation caused by the interplay between a phase separation and smectic ordering in addition to normal phase separation; (i) the formation of a transient network of lamellar phase which is similar to the network pattern observed in viscoelastic phase separation (VPS) and (ii) the formation of a metastable cellular structure of the lamellar phase. By analyzing their dynamics and internal structures, we conform that the viscoelastic contrast between the lamellar and the sponge phase, which is the origin of the VPS-like process, is due to the elastic nature of the smectic order. Furthermore, the cellular structure is turned out to be favored to attain macroscopic smectic order. We successfully control the morphology among droplet, network and foam by changing the heating rate.

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