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Crystal-Growing with Rayleigh-Plateau Instability LINGZHI CAI, Princeton University, JOEL MARTHELOT, Aix Marseille University, PT BRUN, Princeton University — We use the Rayleigh-Plateau instability to fabricate structures in a 3D printing context. We deposit threads of glycerol in an immiscible polymeric bath. Owing to capillary effects these threads break into a collection of drops. As the polymer cures, these drops are permanently captured into the matrix, thereby forming a composite material. We propose a methodology to vary the breakup wavelength of liquid threads and reduce the polydispersity of droplets using a solid boundary template with a characteristic wavelength. In addition, by tuning the spacing between successive threads, we are able to fabricate a crystal-like structure in these composite materials. The pattern formation process is robust: the crystal structure exhibits self-healing of initial or accidental defects. Existing theories (for example, spatio-temporal stability analysis) are adapted to our problem so as to rationalize our experimental results. In turn, we aim to take advantage of our model for the directed control of the instability toward the design of material with prescribed properties and function.

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