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Blistering pattern and formation of nano-fibers in capillary thinning of polymer solutions CHRISTIAN WAGNER, RAINER SATTLER, STEPHAN GIER, Technische Physik, Universitaet des Saarlandes, 66041 Saarbruecken, JENS EGGERS, School of Mathematics, University of Bristol, University Walk, Bristol BS8 1TW — When a dilute polymer solution experiences capillary thinning, it forms an almost uniformly cylindrical thread, which we study experimentally. In the last stages of thinning, when polymers have become fully stretched, the filament becomes prone to instabilities, of which we describe two: A "breathing" instability, originating from the edge of the filament, and a sinusoidal instability in the interior, which ultimately gives rise to a Rayleigh Plateau instability followed "blistering" pattern of beads on the filament. We describe the linear instability with a spatial resolution of 80 nm in the disturbance amplitude. Preliminary micro-PIV measurements indicate the existence of irregular flow fields. For sufficiently high polymer concentrations, the filament eventually separates out into a "solid" phase of entangled polymers, connected by fluid beads. A solid polymer fiber of about 100 nanometer thickness remains, which is essentially permanent.

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