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Rayleigh-Taylor instability under a curved substrate HYOUNGSOO KIM, NAIMA HAMMOUD, HOWARD STONE, Princeton University — The instability of a thin film under a curved substrate is studied experimentally. A thin film layer is uniformly coated inside a concave surface. We investigate the evolution of the liquid layer by varying the film thickness and the radius of curvature. Two typical perturbation patterns are observed; a flow perturbation in the angular direction and a periodic wavy pattern in the axial direction. These modes are observed at different Bond numbers. Although the classic Rayleigh-Taylor instability of a thin film under a flat substrate is unconditionally unstable, our experimental study highlights that the thin film is conditionally stable due to the curvature. If the aspect ratio between the thin film thickness and the radius of the curved substrate is small enough, the upside-down thin film is always stable. We compare our results with theory (P. Trinh and colleagues).

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