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Centrifugally Driven Rayleigh-Taylor Instability MATTHEW SCASE[1], RICHARD HILL[2], University of Nottingham — The instability that develops at the interface between two fluids of differing density due to the rapid rotation of the system may be considered as a limit of high-rotation rate Rayleigh-Taylor instability. Previously the authors have considered the effect of rotation on a gravitationally dominated Rayleigh-Taylor instability and have shown that some growth modes of instability may be suppressed completely by the stabilizing effect of rotation (Phys. Rev. Fluids 2:024801, Sci. Rep. 5:11706). Here we consider the case of very high rotation rates and a negligible gravitational field. The initial condition is of a dense inner cylinder of fluid surrounded by a lighter layer of fluid. As the system is rotated about the generating axis of the cylinder, the dense inner fluid moves away from the axis and the familiar bubbles and spikes of Rayleigh-Taylor instability develop at the interface. The system may be thought of as a fluid-fluid centrifuge. By developing a model based on an Orr-Sommerfeld equation, we consider the effects of viscosity, surface tension and interface diffusion on the growth rate and modes of instability. We show that under particular circumstances some modes may be stabilized.

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