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Floquet Stability of Tank-treading and Tumbling Capsules in Viscous Shear Flow SPENCER BRYNGELSON, JONATHAN FREUND, University of Illinois at Urbana-Champaign — Elastic capsules in homogeneous viscous shear flow are observed to display different kinematic behavior, depending on the shear rate, membrane material properties, and resting capsule shape. The stability of their motion has been mapped out, at least in part, via empirical observations of simulations; we build upon this approach with a direct stability formulation and analysis that includes a complete description of the flow-coupled elastic capsule. In our formulation, a linear system is constructed from a boundary integral description via an approach that depends upon the orthogonal basis functions used to represent the capsule geometry. Floquet multipliers are computed to classify the stability of the kinematics. These quantify how viscous dissipation rapidly damps most disturbances. However, we also identify disturbances that decay slowly, over many periods of the capsule motion. We extend our analysis to accommodate an oscillatory extensional flow configuration, which includes transient and time-global instabilities.

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