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Fragmenting a viscous cylindrical fluid filament using the Faraday instability SASWATA BASAK, SAGAR PATANKAR, RATUL DASGUPTA, Indian Institute of Technology, Bombay — Faraday waves are nonlinear standing waves that appear on a liquid surface enclosed inside a vibrating container. A recent study by us (J. Fluid Mech. 2018, vol. 857, pp. 80−110.) has shown that the Mathieu equation governs the amplitude of small amplitude standing waves occuring on an inviscid cylindrical filament, when it is subjected to radial, pulsating body force. In the present study, we extend our linear stability analysis to a viscous cylindrical fluid filament using the toroidal-poloidal decomposition. We obtain the stability chart using numerical Floquet analysis. The stability curves are found not to touch the wavenumber (k) axis, when the viscosity of the fluid is taken into account, consistent with earlier observations by Kumar & Tuckerman, J. Fluid Mech. 1994, vol. 279, pp. 49−68, Adou & Tuckerman, J. Fluid Mech. 2016, vol. 805, pp. 591−610. in other geometries. The stabilisation of otherwise unstable Rayleigh−Plateau modes through forcing, is found to be extended in time for the viscous filament when compared to the inviscid one. We will show the possibility of fragmenting a filament using the Faraday mechanism and compare linearised predictions with Direct Numerical Simulations.

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