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Radial fingering at an active interface AMARENDER NAGILLA, IITB Monash Research Academy, RANGANATHAN PRABHAKAR, Department of Mechanical and Aerospace Engineering, Monash University, Australia, SAMEER JADHAV, Chemical Engineering Department, Indian Institute of technology Bombay, India — It has been suggested that the shapes of single cells crawling on surfaces [Callan-Jones et al., Phys. Rev. Lett., 100:258106, 2008] and those of the fronts of thin layers of cells collectively expanding to close a wound [Mark et al., Biophys. J., 98:361-370, 2010] are the results of fingering instabilities. Motivated by these studies, we investigate the conditions under which an actively forced interface between a pair of immiscible viscous fluids will destabilize under Hele-Shaw confinement. The case of a circular active interface with surface tension and bending resistance is considered. Active forces exerted by the inner fluid at the interfacial region can be either completely internal or due to interactions with the confining substrate. In addition, the effects of cell growth or actin depolymerization or external injection of cell suspensions are modeled by including a distributed source and a point source of arbitrary strengths. Linear stability analysis reveals that at any given mean radius of the interface, its stability is dictated by two key dimensionless parameters. We discuss the different regions in a state space of these parameters.

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