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Thermocapillary instabilities with crystal and feed rod rotation in laterally heated liquid bridge LAURENT MARTIN WITKOWSKI, Universite Paris VI / Limsi-CNRS Orsay, LYES KAHOUADJI, JOHN S. WALKER, University of Illinois Urbana Champaign — Rotation is involved in many industrial processes for crystal growth. The main reason is that heating is usually not uniform in the azimuthal direction. A drawback (or advantage) of rotation is that it modifies the flow originating from thermal or electromagnetic sources. In the needle-eye float-zone process, the optimum angular velocity of the feed rod and crystal is found empirically. The ratio of these velocities is often negative but not always. Early numerical studies focused on the baseflow of the melt and were restricted to axisymmetry. The main finding is that when rotation is large enough the flow is confined toward the periphery as a result of Taylor column effect. More recent research is devoted to the stability of thermocapillary convection to tridimensional disturbances either by direct numerical simulations or by linear analysis but few relate to the effect of rotation. In order to have a better understanding of the effect of rotation rate on the critical Marangoni number for a laterally heated liquid bridge, we have studied the stability of tridimensional perturbation by a linear analysis for various angular velocity ratio. The competition between different azimuthal modes has been explored and some interpretations are given.

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