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Interfacial flow control in two-phase systems with application to liquid bridges[1] ILYA RYZHKOV, Institute of Computational Modelling SB RAS, VALENTINA SHEVTSOVA, Universite Libre de Bruxelles — We perform a theoretical study of thermocapillary flows and their stability in a two-phase system of infinite liquid column surrounded by the gas layer. This study is a complementary step in the JEREMI project (Japanese–European Research Experiment on Marangoni Instability). It is devoted to the development of efficient means for controlling thermocapillary flows in liquid bridges (columns) and scheduled to fly on ISS in 2011. The flows are controlled by applying mechanical stresses to the interface and varying the interfacial heat exchange by blowing gas around the liquid. The analytical solution describing stationary velocity and temperature profiles in the liquid and gas is derived. It is shown that liquid motion can be completely suppressed by the gas flow. The linear stability analysis of stationary flows is performed. It is shown that when the gas flow is opposite to (co-directed with) that of liquid on the interface, the system becomes more (less) stable. It occurs due to mechanical stresses applied to the interface and interfacial heat exchange. Consideration of liquid bridge with the surrounding gas provides better agreement with experimental results than previous calculations without gas phase.

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