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Marangoni Convection Experiment in Binary Mixtures J. ZHANG, R. BEHRINGER, Duke University, A. ORON, Technion-Israel Inst. of Technology — Marangoni instabilities in binary mixtures are believed to be different from pure liquids. In contrast with a large amount of experimental work on Marangoni convection in pure liquids, such experiments in binary mixtures are not available in the literature. Using commonly available binary mixtures such as sodium chloride/water, we have systematically investigated the pattern formation for a set of substrate temperature and solute concentrations. A liquid film is drawn on a silicon wafer which maintains a constant temperature, while its surface opens directly to the air with a fixed room temperature. The flow patterns evolve with time, driven by surface tension fluctuations due to evaporation and the Soret effect, while the air-liquid interface does not deform. A standard shadow graph method is used to keep track of the pattern formation as a function of time. The patterns are mainly composed of quasi-static polygons and rolls. The mean pattern-size gradually increases during the evolution. The evaporation affects the pattern formation mainly at the early stage and the local evaporation tends to become uniform at the film surface. The Soret effect becomes important at the later stage and affects the mixture for a large mean solute concentration where the Soret number is significantly above zero. The strength of convection increases with the initial solute concentration and the substrate temperature. Our findings differ from the theoretical predictions in which evaporation is neglected.

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