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Marangoni convection in ethanol and water mixtures[1] JIE ZHANG, Department of Physics and CNCS, Duke University, NC 27708, USA, ROBERT BEHRINGER, Department of Physics and CNCS, Duke University, Durham, NC 27708, USA, ALEXANDER ORON, Department of Mechanical Engineering, Technion-Israel Institute of Technology, Haifa 32000, Israel — Marangoni convection has been studied in liquid thin films using a binary mixture of ethanol and water. The films are open to the ambient room air during all experimental runs. The evaporation speed of ethanol is much faster than water under the usual conditions. Different patterns, including novel, mobile, circular-shaped patterns, were observed at the different initial weight fraction of ethanol. Pattern sizes grow substantially with the increment of the ethanol concentration c. The starting patterns are rather small at c=0.1, with randomly distributed dots. When c increases from c=0.15 to c=0.2, circular-shaped patterns gradually appear, covering the whole system. As c further increases, these circular patterns combine to form bigger structures. At c=0.35, a large-scale mean flow was generated. For a fixed concentration, patterns evolve due to the evaporation of both the solvent and the solute. We contrast the present system to what occurs in binary mixture of NaCl and water, where only single component, water, evaporates (Jie Zhang et al. PRE 76, 016306 (2007)).

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