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Flow patterns in free liquid film caused by thermocapillary effect ICHIRO UENO, LINHAO FEI, YOSUKE KOWATA, TOSHIHIRO KANEKO, Tokyo University of Science, DONALD PETTIT, NASA — The basic flow patterns realized in a thin free liquid film driven by the thermocapillary effect are focused. Spetial attention is paied to the effect of the volume ratio of the liquid film to the hole sustaining the film on the flow patterns. We prepare a thin liquid film of less than 0.5 mm in thickness in order to stably realize the film under normal gravity. Liquid has in general negative temperature coefficient of it surface tension; that is, the fluid is driven to the colder to hotter regions by the non-uniform surface-tension distribution. In the case of thin free liquid film, however, it is found that a unique flow pattern is induced. One of the present authors, DRP, carried out a series of experiments under microgravity condition in the International Space Station (ISS) in 2003. He prepared a ring made of metal, and formed a thin film of water inside the ring. Once he added a non-uniform temperature distribution to the film by placing a heated iron at one end of the ring, a net flow toward the heated iron was realized. In order to understand flow patterns, we focus on the flow structures of the thermocapillary convection in a cross section normal to the end walls as well as the surface temperature distributions.

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