IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Fluid and Materials Sciences (2)

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STUDY ON THERMOCAPILLARY-BUOYANCY MIGRATION OF AXISYMMETRIC TWO DROPS

Abstract

The investigation of thermocapillary flow is important for basic research, as well as for material sciences, chemical engineering, and space manufacturing. When the gravity effect is greatly reduced, the interfacial phenomenon becomes important. The motion of drops driven by temperature gradients is related to the thermocapillary Marangoni convection. The Marangoni effects are caused by interface tension changes, typically interface tension becoming decreased with increasing temperatures. Under different conditions, The Marangoni effects can cause a drop to move in the opposite direction. The migration and interaction of axisymmetric two drops in a vertical temperature gradient is investigated experimentally on the ground. A silicon oil is used as the continuous phase, and a water-ethanol mixture is used as the drop phase, respectively. The migration and interaction of two drops, under the combined effects of buoyancy and thermocapillary, is recorded by a digital holographic interferometry measurement in the experiment to analyse the velocities and temperature distribution of the drops. As a result, when two drops migrate together, the drop affects the other drop by perturbing the temperature field around itself. For the leading drop, the velocity is fasterthan the one of the isolated drop, and the maximum of the interfacial temperature distribution is larger than the one of the isolated drop. For the trailing drop, the velocity is slower than the one of the isolated drop, and the maximum of the interfacial temperature distribution is less than the one of the isolated drop. The influence of the dimensionless initial distance between the drop centres to the drop migration is discussed in detail in this study.