

MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Microgravity Experiments from Sub-Orbital to Orbital Platforms (3)

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AN OBSERVATION OF DIFFUSION PROCESS IN MICROGRAVITY BY MACH-ZEHNDER
INTERFEROMETER

Abstract

Mass transfer associated with diffusion takes place when the distribution of composition concentration in a solution is uneven. In normal gravity, however, the mass transfer due to diffusion is usually accompanied by mass transfer caused by convection and sedimentation. The diffusion coefficient of binary solutions is an important parameter in modeling studies of protein crystal growth. However, it is difficult to accurately measure it with ground experiments because of the influence of convection and sedimentation caused by gravity. This situation impels scientists to conduct experiments on the diffusion coefficient of binary solutions in a microgravity environment to eliminate the effect of sedimentation and convection. In this study, a specially designed March-Zehnder interferometer was used to monitor the mass transfer process of a water droplet in EAFP protein solution under both normal gravity and microgravity condition provided by the No. 8 Shi Jian satellite. A series of the evolution charts of mass distribution during the diffusion process of the liquid droplet are presented and the relevant diffusion coefficient is determined. We also compared the experiment under microgravity with those under the normal gravity to demonstrate the significant influence of gravity on the mass transfer process for a liquid droplet. We also demonstrate that a well designed March-Zehnder interferometer is able to be used in space experiment facing the challenge from the serious test of violent shock and vibration during the rocket launching period.