

微小重力を利用した惑星起源物質の形成シミュレーション

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Simulation of the Formation Process of the Early Solar System Using In-Situ Observation under Microgravity

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Abstract

The nucleation of silicate materials from the vapor was experimentally investigated under microgravity condition using an aircraft or a drop facility, for the simulation of the dust formation process in the early solar system. The nucleation of amorphous silicate materials from the vapor in microgravity occurred at the high supersaturation ratio, which ranges from 10^{23} to 10^{33} and the incubation time for the nucleation ranges from 10^{-8} to 10^{-10} sec.cm³. The fine particles formed in microgravity are fine crystal particles, the diameter of which is a few hundred nm, while the fine particles formed under normal gravity are amorphous particles, the diameter of which was 20 to 30 nm. We have also applied the laser interferometer for the measurement of the temperature and the gas concentrations. The large increase of the refractive index was found to be due to crystallization near the melt interface in the microgravity experiment. These results indicate the rapid amorphous nucleation followed by crystallization.