Surface Oscillation of Viscous Droplet Under Microgravity and on Ground

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Using ADL technique combined with the acoustic oscillation method, we obtained surface oscillation of molten oxide of CaO-SiO2-Mn3O4-TiO2 system. Spherical shaped solid samples with about 2mm in diameter were levitated by the gas-jet flow from the conical nozzle, and then solid samples were melted under the container-less conditions by CO2 laser irradiation. For the oscillating drop experiments, we applied two CO2 laser irradiation to the samples from the top and the bottom in order to reduce the temperature gradient in samples. The sample temperature was measured by the single-color pyrometer with wavelength of 980nm. The static shape of levitated droplet without the surface oscillation, we obtained the volume of droplet with the assumption of symmetrical ellipsoid shape, and then we obtained the density using the average mass of samples measured before and after the experiments. Density was used for the confirmation of sample shape symmetry around vertical axis. It is basic assumption and important for surface oscillation by the oscillating drop experiments. For the oscillating drop experiments, we newly applied the acoustic oscillation system into the gas flow path for the gas jet. By the acoustic oscillation system, the levitation gas-jet flow from the conical nozzle has single wavelength oscillation, as a result the droplet oscillates with the same frequency as the input signal. Moreover, we performed oscillating drop experiments using ESL under microgravity using electrostatic levitation furnace (ELF) installed in the International Space Station (ISS). We obtained surface tension and viscosity of molten CaO-SiO2-Mn3O4-TiO2. Both of surface tension and viscosity agreed with data obtained by ELF in ISS. Agreement of these values with the values obtained under microgravity means that the surface of molten CaO-SiO2-Mn3O4-TiO2 droplet oscillated with the natural oscillation of droplet. The levitated droplet under microgravity is the completely spherical shape without the effect of gravitational force. Moreover, under microgravity the damping time of surface oscillation is correctly obtained because without large levitation force. At presentation, we discuss about surface oscillation phenomena levitated aerodynamically on ground from the comparisons with microgravity data.