Effect of Oxygen Partial Pressure on Surface Oscillation of Electromagnetically Levitated Liquid Droplets Under Microgravity Conditions

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Microgravity conditions have advantages of measurement of the surface tension and the viscosity of liquids of metallic alloys by the oscillating drop method with an electromagnetic levitation (EML) device as reported by Egry *et al* [1]. From the surface oscillation phenomena under the microgravity conditions, we can precisely obtain the surface tension and viscosity of high-temperature liquids with wide temperature range including supercooled regions. However, the liquid droplet surface of metallic alloys is highly reactive to the oxygen. Therefore, surface tension of liquid metals is sensitively changed by the oxygen partial pressure in atmospheric conditions [2,3]. We have measured the dependence of oxygen partial pressure on surface tension of liquid Ag and Cu using the Parabolic Flight Levitation Experiment Facility (PFLEX) on board flight experiments with the change of oxygen partial pressure [4]. In the measurements, we found the oxygen partial pressure dependence of viscosity of liquid Cu. This is not the true value of viscosity of liquid Cu, but the apparent viscosity which is caused by the change of surface oscillation damping affected by oxygen partial pressure. This means that viscosity measurement of liquid metals by oscillating drop method also must account the oxygen partial pressure in atmospheric conditions in order to obtain correct values. We propose, therefore, a method to obtain correct value of viscosity of liquid metals by the oscillation drop method with EML technique.

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