Measurements of Density and Evaporation Rate of Ti-6Al-4V Melt with a Electromagnetic Levitation Technique

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Ti-6 mass %Al-4 mass %V (Ti-6Al-4V) alloy has high strength and high corrosion resistance, and it is used as aircraft and biomedical materials. Additive manufacturing is gathering attention because it is suitable for wide variety of products in small quantities. Ti-6Al-4V powder is melted by the irradiation of laser beam or electron beam in additive manufacturing. Thermophysical properties of this melt are necessary for controlling the solidification microstructure. As a first step, the density of the melt was measured by the electromagnetic levitation (EML) technique in a static magnetic field at temperatures ranging from 1850 to 2100 K [1]. The density of the Ti-6Al-4V melt has linear negative temperature dependence. The evaporation rate of the melt is an important parameter for additive manufacturing. In this study, the evaporation rate was also evaluated from mass change after keeping the melt at each target temperature from 2000 to 2150 K for 300 s in Ar-5 vol %H_2 gas atmosphere of 0.5 kPa by the EML technique. The evaporation rate increases exponentially with the inverse temperature decreases.

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References:

[1]. M. Watanabe, M. Adachi and H. Fukuyama, J. Mater. Sci., **51** (2016), 3303–3310.