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電磁浮遊法を用いたスズ融体の表面張力測定

Surface Tension Measurement of Tin Melts Using Electromagnetic Levitation

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1. Introduction

Among high-temperature melt processes, brazing is greatly affected by wettability due to the large ratio of surface area to melt volume. Accurate surface tension of molten tin at different temperatures is necessary to optimize the brazing process and to elucidate the phenomenon. However, the reported surface tension of tin, one of the important brazing materials, is dichotomized into a gentle gradient and a steep gradient, and among the reported values, the gentle gradient side was often measured in a hydrogen atmosphere. In this study, an electromagnetic levitation apparatus, one of the containerless methods, was used to measure the surface tension of tin melts more accurately than before by using ultra-pure tin samples.

2. experimental method

Tin samples with a mass purity of 99.99999% (7N) were used and cleaned using hydrochloric acid and acetone. It was set in an electromagnetic levitation apparatus and levitated and melted with Ar-He gas flowing at 2 L/min. The surface vibration behavior and temperature of the sample were photographed, and the surface vibration frequency and translational motion frequency were identified from the photographed droplet images, and the surface tension was calculated.

3. Results and Discussion

The surface tension of a 7N tin melt was measured in an Ar-He atmosphere (●) and in an Ar-He-H_2 atmosphere (●). The surface tension of the tin melt measured in this study decreased linearly with increasing temperature regardless of the atmosphere. These results were in good agreement regardless of the atmosphere. The gradient of the surface tension with temperature is relatively large. The hydrogen and oxygen partial pressures were changed, but no change was observed in the measurement results.

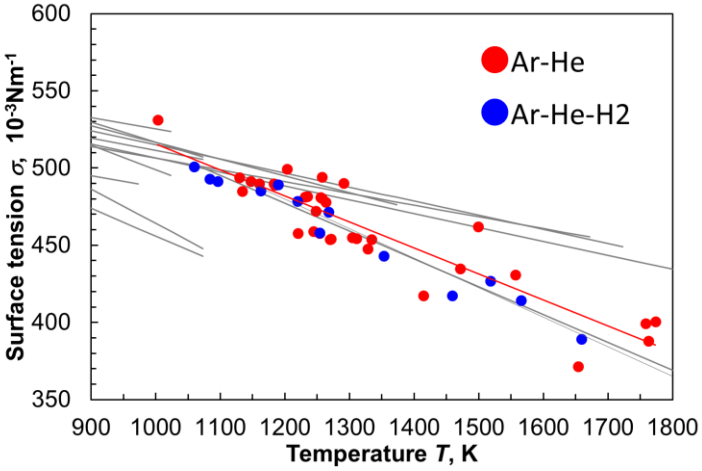

Figure 1. Relation between surface tension of tin melt and measured atmosphere

4.References

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