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Thermal Storage Material Using Miscibility Gap Alloys

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1. Introduction

Thermal energy storage is an attractive technology for stabilizing unstable electricity supplies generated from renewable energy sources[1)]. Phase Change Materials (PCMs), which store energy through latent heat, hold great promise for the development of efficient thermal energy storage systems[2)]. The metallic PCMs are appropriate candidates due to their high energy density at the melting temperature and high thermal conductivity, both properties needed to achieve high energy exchange efficiency[3)]. Since operating at higher temperatures are desirable to enhance system efficiency, preventing chemical reactions within the PCMs is crucial for advancing thermal energy storage technologies. To achieve this objective, Miscibility Gap Alloys (MGAs) are expected to prevent chemical reactions by covering the low-melting-point phase with a phase that is stable at high temperatures[4)].

To investigate the procedure to control the structure and to evaluate the capacity of Miscibility Gap Alloys as thermal storage materials, we have embarked on a project aimed at measuring the thermophysical properties of liquid alloy of the miscibility gap systems utilizing the International Space Station (ISS). The thermophysical properties such as density, surface tension, and viscosity were measured using Electrostatic Levitation Furnace (ELF), which has been installed in Kibo-module of ISS. Addition to the thermophysical properties measurement, the properties of MGAs for thermal energy storage was also investigated underground experiment. The latest progress of the project will be presented.

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