

**Masahiro SUSA, Prof.**

**Department of Innovative and Engineered Materials**

## **1. Main Research Results**

### **1) Radiation heat transfer reduction across mould flux for continuous casting by its crystallization**

In continuous casting, the mould flux existing between the shell and the mould plays important roles in infiltration of the shell and heat extraction from the shell. High speed continuous casting requires slow cooling, which has been achieved by crystallisation of mould fluxes. To elucidate this mechanism, the present study aimed to measure reflectivities and transmissivities of mould fluxes having various degrees of crystallinity and to evaluate the radiation transfer characteristics of the fluxes on the basis of a model. It has been found that reflectivities enhanced by crystallisation reduce radiation heat flux from the shell to the mould. Furthermore, the effect of iron oxides on the radiation heat transfer has also been understood, based upon which a new flux has been proposed.

### **2) Measurements of emissivities for molten Fe-C alloys**

Emissivities of molten Fe – x mass% C alloys (x = 0 – 4.85) have been measured at the melting or liquidus temperatures in the wavelength ranges 500 – 1000 nm and 1400 – 2500 nm, and the reproducibility of the measurements has also been confirmed. Conventionally, sintered MgO plates were used as the substrate, which did not provide a stable measurement condition. In the present work, alumina crucibles have been used instead to reduce the vibration of the samples. The emissivities measured increase slightly with increasing the C concentration up to 3.8 mass%, beyond which the emissivities shows a steep increase.

### **3) Measurements of electric resistivities for molten Ge-Sb-Te alloys**

Sb<sub>2</sub>Te<sub>3</sub> is a promising candidate material for phase change memory. The present work aimed at measuring electric resistivities of this substance in the liquid state using the four-terminal method. Tungsten was used for the leads because this metal has high melting point and is used as electrodes in phase change memory. The electric resistivities measured show negative temperature dependence in the temperature range from its melting point to 1000 K with good reproducibility. This finding suggests that liquid Sb<sub>2</sub>Te<sub>3</sub> has semi-conduction.

## **2. List of publication (original article, comment/book)**

### **1) Original Paper**

- (1) **Refractive Index Measurements of CaF<sub>2</sub> Single Crystal and Melt by Ellipsometry**; MD. Shakhawat Hossain Firoz, Takashi SAKAMAKI, Rie ENDO, MASAHIRO SUSA: High Temperatures-High Pressures, **37** (2008) 163-173
- (2) **Mechanism of Heat Transfer Reduction by Crystallization of Mold Flux for Continuous Casting**; Hideko NAKADA, Masahiro SUSA, Yusuke SEKO, Miyuki HAYASHI, Kazuhiro NAGATA, ISIJ International, **48** (2008) 446-453

### **2) Review & Books**

- (1) **Emissivities of High Temperature Metallic Melts;** Masahiro SUSU, Rie K Endo, High-Temperature Measurements of Materials, Springer Berlin Heidelberg, (2009) 111-129

### 3. Invited/Plenary Talks in Conference

#### 1) International Conference or Workshop

- (1) **Guideline for Designing Mold Flux for Mild Cooling in Terms of Crystallization and Crystal Morphology;** Hideko NAKADA, Masahiro SUSU, Miyuki HAYASHI, Kazuhiro NAGATA, The 4th International Congress on the Science and Technology of Steelmaking (Gifu, JAPAN) (2008) 706-709(Oral)
- (2) **Electric resistivity measurement of liquid Ge-Sb-Te materials;** R. Endo, Y. Jinnai, R. Lan, M. Kuwahara, Y. Kobayashi, M. Susa, Proc of the 20th Symposium on Phase Change Optical Information Storage PCOS 2008 (Shuzenji, JAPAN) 20 (2008) 53-55 (Oral)
- (3) **Electric and thermal conductivities of Ge-Sb-Te bulk materials;** Rui Lan, Yuri Jinnai, Rie Endo, Masashi Kuwahara, Yoshinao Kobayashi, Masahiro Susa, **18th European Conference on Thermophysical Properties, (Pau,France), (2008)**(Poster)
- (4) **Thermal conductivity measurements and prediction for liquid Sn-In alloys;** Rie Endo, Amica Miyamura, Masahiro Susa, **18th European Conference on Thermophysical Properties (Pau, France), (2008)** (Poster)

### 4. Patent

1 application