Differential Thermal Analysis of the Nonstoichiometric Spinel, $\text{MgO} \cdot n\text{Al}_2\text{O}_3$

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非化学量論組成スピネル, $\text{MgO} \cdot n\text{Al}_2\text{O}_3$ の示差熱分析

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There is a wide solid solution range, which is called a ζ -spinel solid solution, in $\text{MgO} \cdot \text{Al}_2\text{O}_3$ - Al_2O_3 system.¹⁾

The exsolution with the exothermic reaction occurs when the solid solution is annealed at the temperature which is lower than that of sintering.²⁾

In this note, the change of the exothermic peaks on the differential thermal analysis curves is described in relation to the degree of nonstoichiometry of the spinels.

The ζ -spinel solid solution, $\text{MgO} \cdot 3\text{Al}_2\text{O}_3$, $\text{MgO} \cdot 2\text{Al}_2\text{O}_3$ and $\text{MgO} \cdot 1.5\text{Al}_2\text{O}_3$ were synthesized from the guaranteed reagent chemicals by high tempera-

ture (1850°C) sintering and subsequent water quenching.

The degree of nonstoichiometry of the spinel solid solution is evaluated from the relation between the lattice constant and the chemical composition¹⁾.

$\text{MgO} \cdot 3\text{Al}_2\text{O}_3$ $a = 7.977 \text{ \AA}$,

$\text{MgO} \cdot 2\text{Al}_2\text{O}_3$ $a = 8.006 \text{ \AA}$ and

$\text{MgO} \cdot 1.5\text{Al}_2\text{O}_3$ $a = 8.035 \text{ \AA}$.

The particle size is postulated all the same.

The differential thermal analysis curves are shown in Fig. 1.

It is confirmed that the exsolution reaction of the ζ -spinel solid solution is exothermic, and that the exothermic peak area is qualitatively proportional to the degree of nonstoichiometry and the peak temperature is inversely proportional to the degree of nonstoichiometry.

Fig. 1. Differential thermal analysis curves of nonstoichiometric spinels, $\text{MgO} \cdot n\text{Al}_2\text{O}_3$.

Conditions of differential thermal analysis: Sample Pan; PtRh, Standard; α - Al_2O_3 , Atmosphere; Air, Thermocouples; Pt-PtRh 13%, Temp. range; 20 mV, Heating rate; 10°C/min., Range D.T.A.; $\pm 100 \mu\text{V}$ Chart speed; 2.5 mm/min.

References

- 1) K. Shirasuka et al., *Yogyo-Kyokai-Shi*, **82**, 650 (1974).
- 2) K. Shirasuka et al., *Yogyo-Kyokai-Shi*, **83**, 603 (1975).