The Effect of Cation Species on the Sulfur Solubility of CaO-FeO-Al2O3-SiO2 Melts

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Abstract

The charge compensation effect of Ca2+ and Fe2+ on the sulfur solubility of CaO-FeO-Al2O3-SiO2 melts has been studied. The content of cation species (MO, M=Ca, Fe) and anion groups (AlO45-, SiO44-) were varied to determine the effect of charge compensation [1,2] on the sulfur solubility in high temperature ionic melts. The coordination number of aluminum ion in the super-cooled liquids was identified by deconvolution with PeakFitTM 4.0 of 27Al 500MHz Solid NMR Spectra. [3] The proportion of Qn was analyzed by Raman spectroscopy. [4] As a result, the sulfide capacity represents a linear relationship according to the MO activity, as an index of the basicity. In the case of the cationic excess region (M2+/Al3+ > 1.0), the sulfide capacity is directly proportional to the basicity due to high S2- stabilization by excess cation. However, in the case of the cation deficient region (M2+/Al3+ < 1.0), the sulfide capacity was shown to be constant depending on the basicity.

Charge Balancing Join : (Ca2++Fe2+)/2(Fe3++2Al2O3)=1 (1)

The reason is that S2- activity coefficient of the melts increase due to the absence of M2+ required for charge balancing with AlO45- and FeO45-. Also, the sulfur stabilization region was determined by the kind of the cation species (M2+). The charge balancing region is changed by the stabilization of Al3+ with Fe3+ [5] and influences on the cation substitution effect on the sulfur solubility.

References


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