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LETTER

A method for controlling alkali-metal oxide activities in one-atmosphere experiments and its application to measuring the relative activity coefficients of $NaO_{0.5}$ in silicate melts

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ABSTRACT

The activity of alkali metal oxides can be controlled in one-atmosphere wire-loop experiments at high temperature by suspending a crucible containing alkali silicate melt beneath the samples. The method has been applied to measuring the activity coefficient of $NaO_{0.5}$ in a series of CMAS-$NaO_{0.5}$ melts relative to that in the anorthite-diopside eutectic composition at 1400 °C, using a reservoir of $NaO_{0.5}$-SiO_2 melt. The results show that this relative activity coefficient decreases strongly with SiO_2, increases with CaO and MgO, but is insensitive to $AlO_{0.5}$. This latter behavior is inconsistent with "quasi-crystalline" models of melt thermodynamics that hypothesize Na-Al species.