

Comparative Studies of the Thermophysical Properties of Crystalline and Vitreous Alkali Tri- and Tetrasilicates

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The heat capacities of the vitreous lithium and sodium trisilicates ($\text{Li}_2\text{O}\cdot 3\text{SiO}_2$; $\text{Na}_2\text{O}\cdot 3\text{SiO}_2$) and vitreous potassium tetrasilicate ($\text{K}_2\text{O}\cdot 4\text{SiO}_2$) were measured from 5 to 350 K using equilibrium adiabatic calorimetry. The data was adjusted to end-member composition using a scheme developed for adjustment of nonstoichiometric silicates to stoichiometric compositions and the vitreous/crystalline differences evaluated. Shottky function-like deviation is observed for each compound. The heat capacity data was compared and evaluated using the formalism of S. W. Barber and fitted to a series of orthogonal polynomials. Integration of the polynomials yielded appropriate thermophysical properties. $\{S_0 - S_0(0)\}/R$ values at 298.15 K for stoichiometric vitreous Li, Na tri- and K tetrasilicates are: 21.57, 26.05 and 34.19 respectively.