American Mineralogist, Volume 84, pages 1830–1842, 1999

Dry melting of high albite

LAWRENCE M. ANOVITZ* AND JAMES G. BLENCOE

Geochemistry Group, Chemical and Analytical Sciences Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831-6110, U.S.A.

ABSTRACT

The properties of albitic melts are central to thermodynamic models for synthetic and natural granitic liquids. We have analyzed published phase-equilibrium and thermodynamic data for the dry fusion of high albite to develop a more accurate equation for the Gibbs free energy of this reaction to 30 kbar and 1400 °C. Strict criteria for reaction reversal were used to evaluate the phase-equilibrium data, and the thermodynamic properties of solid and liquid albite were evaluated using the published uncertainties in the original measurements. Results suggest that neither available phase-equilibrium experiments nor thermodynamic data tightly constrain the location of the reaction. Experimental solidus temperatures at 1 atm range from 1100 to 1120 °C. High-pressure experiments were not reversed completely and may have been affected by several sources of error, but the apparent inconsistencies among the results of the various experimentalists are eliminated when only half-reversal data are considered. Uncertainties in thermodynamic data yield large variations in permissible reaction slopes. Disparities between experimental and calculated melting curves are, therefore, largely attributable to these difficulties, and there is no fundamental disagreement between the available phase-equilibrium and thermodynamic data for the dry melting of albite. Consequently, complex speciation models for albitic melts, based on the assumption that these discrepancies represent a real characteristic of the system, are unjustified at this time.