THE ENTHALPY OF FORMATION OF NATURAL FERRIERITE

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The natural hydrothermal zeolite ferrierite having the composition $(Ca_{1.20}Mg_{0.48}Na_{2.52}K_{0.30})[Al_{6.12}Fe_{0.06}Si_{29.82}O_{72}]\cdot 17.34H_2O$ (Tedzami, Georgia) was an object of experimental thermochemical investigation on high temperature heat-flux Tian-Calvet microcalorimeter. The standard enthalpy of formation was obtained by high-temperature solution calorimetry in molten $2PbO\cdot B_2O_3$ at T=973 K. The "transposed temperature drop solution calorimetry" method was used to measure the sum of enthalpy increment and enthalpy of solution of zeolite, $[H^o(973\ K)-H^o(298.15\ K) + \Delta_{sol}H^o(973\ K)]$=2841.9 ± 38.8 kJ/mol. The enthalpy of formation from oxides was calculated using experimental data on $[H^o(973\ K)-H^o(298.15\ K) + \Delta_{sol}H^o(973\ K)]$ for ferrierite and constituent oxides (table): $\Delta_fH^o_{ox}(298.15\ K) = -801\pm58$ kJ/mol.

Table. Calorimetric data for constituent oxides used to calculate the enthalpies of formation of ferrierite (kJ/mol)

Oxide	$[H^o(973\ K)-H^o(298.15\ K) + \Delta_{sol}H^o(973\ K)]$	$-\Delta_fH^o_{el}(298.15\ K)$
Na_2O(s)	-111.8±0.9	414.8±0.3
K_2O(s)	-193.7±1.1	363.2±2.1
MgO(s)	36.38±0.59	601.6±0.3
CaO(s)	-21.78 ±0.84	635.1±0.9
α-Al_2O_3(s)	107.38±0.59	1675.7±1.3
Fe_2O_3(s)	171.59±1.88	826.2±1.3
SiO_2(quartz)	39.43±0.21	910.7±1.0
H_2O(l)	40.9±2.5	285.8±0.1

The enthalpy of formation of ferrierite from the elements was determined using reference data [1] on $\Delta_fH^o_{el}(298.15\ K)$ of oxides (table): $\Delta_fH^o_{el}(298.15\ K) = -39694\pm66$ kJ/mol. At first the thermodynamic characteristics of natural ferrierite were obtained.

Reference

1. *Robie R.A. Hemingway B.S.* Thermodynamic properties of Minerals and Related Substances at 298.15 K and 1 Bar (105 Pascal) Pressure and at Higher Temperatures // U.S. Geol. Surv. Bull. 1995. N. 2131. 462 p.

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