Evaluation of Standard Free Energies of Formation of Clay Minerals by an Improved Regression Method

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Abstract: An improved regression method for the evaluation of standard free energies of formation (ΔG°_f) of clay minerals is here proposed in an attempt to remove some of the limitations of the earlier method (Chen, 1975). Particularly, this method suggests a procedure for the assignment of rankings for $\Sigma \Delta G^\circ_{f,i}$ values. Moreover, an iterative least-squares fitting technique is applied to solve the exponential equation to obtain the estimated ΔG°_f. The estimated ΔG°_f data for the various standard clay minerals are derived and compared with data available in the literature; in general, there is good agreement between the values. It is also shown how the regression method can be extended to clay minerals of variable composition. The ΔG°_f's for several such minerals have been evaluated; a large number of combination equations required for such computations have been listed, so that for other similar minerals the process of evaluation of ΔG°_f is greatly simplified.

Key Words: Clay minerals • Free energies of formation • Regression method