
Solubility of Two High-Mg and Two High-Fe Chlorites Using Multiple Equilibria¹

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Abstract: High-Mg chlorites from Vermont and Quebec and high-Fe chlorites from Michigan and New Mexico were equilibrated at room temperature in the near-neutral pH range. Gibbsite, kaolinite, and hematite of known stability were added to the samples to control unmeasurable variables at calculable levels. Equilibrium solution compositions were obtained from undersaturation and from supersaturation. Other indicators of equilibrium were good agreement between successive analyses over a long period of time, between duplicate samples, between independent systems, and between independent measures of equilibrium. All four chlorites were stable relative to brucite and, with a few exceptions, relative to talc under the conditions of study. When in equilibrium with gibbsite, the $\text{pH} - \frac{1}{2}\text{Mg}^{2+}$ value of the chlorites ranged from 6.3 to 6.5, at a pH_4SiO_4 value of 4.0. These values are in good agreement with prior estimates of chlorite stability. The calculated standard free energy of formation of the chlorites is dependent upon solution Fe^{2+} calculated from the sample Eh and assumed equilibrium with hematite, with the assumption that the Fe^{2+} - Fe^{3+} couple is at the same Eh as the sample.

Key Words: Chlorite • Free energy of formation • Iron • Magnesium • Solubility • Stability

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