Application of the simple salt lattice energy approximation to the solubility of minerals

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Abstract

The simple salt approximation for the lattice energy of double salts is used to provide an estimate of their molar solubilities. These calculations are compared with solubilities obtained from literature thermodynamic data and are within an order of magnitude for about 75% of the 81 minerals and other double salts examined. The solubilities of about two-thirds of the double salts are similar to the solubilities of the less soluble simple salt "constituents," and the solubilities of the other one-third lie between the solubilities of the "constituents." In general, the solubilities of a series of salts with different stoichiometries containing the same ions are dependent on both the stoichiometry of the salt and the proportion of the less soluble constituent. This generalization is rationalized with the simple salt approximation and is used to explain the observed stoichiometries of a variety of minerals.

Keywords: Thermodynamics, solubility, stoichiometry, lattice energy