
Dissolution Kinetics of Phlogopite. II. Open System Using an Ion-Exchange Resin

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Abstract: The rate of dissolution of phlogopite in an open system was measured at low temperature and pressure and at pH 3– 5. The maximum dissolution rate was achieved by maintaining extremely low ionic concentrations in the solution using a cation-exchange resin (hydrogen form) as a trap for released cations. The resin also served as a source of hydrogen ions and acted as a buffer. The concentrations of ions adsorbed on the resin and remaining in solution were measured, along with surface area and cation-exchange capacity. The amount of phlogopite dissolved after 1010 hr was 67 times that dissolved using a CO₂-buffered, closed-system method. During the first hour of the experiment, dissolution was incongruent, but later became congruent from 1 to 1010 hr. From 1 to 200 hr the reaction had linear kinetics. The dissolution rate for the first 200 hr of the reaction was 2.0×10^{-14} mole KMg₃AlSi₃O₁₀(OH)₂/cm²/sec. Since no evidence of parabolic kinetics was found, there is no reason to postulate the formation of a " protective layer."

Key Words: Dissolution • Ion-exchange resin • Kinetics • Open system • Mica • Phlogopite

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