

Mechanism and kinetics of chrysotile dissolution

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It has recently been clarified that the serpentine would be widely distributed in the oceanic crust. The formation and dissolution of serpentine are therefore thought to be an one of factors controlling the magnesium and the carbonate concentrations in seawater. It is very important for understanding of the global elemental cycles. However, there is not appropriate researches on dissolution of serpentine to assess quantitatively. In this context, mechanism and kinetics of chrysotile dissolution were investigated.

Stirred-flow-through dissolution experiments were conducted to measure the dissolution rates of chrysotile under acidic and alkaline conditions, and to evaluate the effect of pH on the rates. The experiments were carried out in HCl-NaCl and NaOH-NaCl mixed aqueous solutions at 50 °C, 0.3 M in ionic strength, 0.2 mL/min in flow rate and in CO₂-free. Our research addresses here the dissolution rates of chrysotile within the complete pH interval under acidic and alkaline conditions. Hereby, possible effects of other variables except for pH were eliminated by conducting all experiments at constant of the factors. Congruent dissolution rates of Na-montmorillonite under the alkaline conditions were obtained from steady state reaction data. The chrysotile dissolution rates increased as function of pH. The results indicate that the dissolution is congruently proceeded and the rate decreases with increasing pH. The rate law was calculated by fitting the dissolution rates to the pHs of output solution and obtained the equations from Si concentrations.