Effects of composition and structure on dissolution rates and mechanisms of micas and chlorites at pH 3

Hirokazu Sugimori[1], Tadashi Yokoyama[2], Takashi Murakami[3]

[1] Geological Sci., Univ. Tokyo, [2] Dept of Earth and Planetary Science, Univ. Tokyo, [3] Deprt. of Earth Planet. Sci.., Univ. of Tokyo

Dissolution experiments of sheet silicates with different compositions and structures have been carried out in a single-pass flow system at pH 3 to understand differences in dissolution rates and mechanisms. The minerals used in the experiments were trioctahedral mica (biotite, phlogopite), dioctahedral mica (muscovite) and two chlorites (clinochlore, chamosite). Biotite and chamosite contained more Fe in the structures than phlogopite or clinochlore. In all experiments, preferential release of interlayer cations (K for micas and Mg for chlorites) was observed and Fe was the most stable element except in the experiment of biotite. The dissolution rates calculated based on Si concentration data show (1) dioctahedral micas are dissolved slower than trioctahedral micas, (2) chlorite is dissolved slower than trioctahedral micas, and (3) Fe-rich chlorite is dissolved slower than Mg-rich chlorite. Biotite and phlogopite are dissolved approximately at the same rate, but have different kinetics about Fe release and expansion of the interlayers.