

**Increase in apparent saturation states during
dissolution processes of Al-hydroxide
by interaction with bacteria**

MOTOHARU KAWANO¹ AND SUMINE OBOKATA²

¹ Department of Earth and Environmental Science,
Kagoshima University, Kagoshima 890-0065, Japan;
kawano@sci.kagoshima-u.ac.jp

² Department of Earth and Environmental Science,
Kagoshima University, Kagoshima 890-0065, Japan;
e05obokt@eniac.sci.kagoshima-u.ac.jp

Dissolution experiments of Al-hydroxide (boehmite) in both abiotic and biotic systems were carried out to evaluate the effects of bacteria on the dissolution processes. Similar dissolution experiments using organic systems containing protein (egg albumin) were also carried to confirm the factors affecting the dissolution of boehmite in the biotic system. The dissolution experiments were performed using batch reactors containing 0.1 g of boehmite purchased from Nakalai Tesque Inc. and 100 ml of 1.0 mM NaCl solution at 25°C for up to 30 days. The abiotic systems contain no bacteria with various solution pH adjusted by HCl or NaOH. The biotic systems contain 10^5 , 10^6 , 10^7 , 10^8 , and 10^9 cells/ml of *Pseudomonas fluorescens* with no nutrients. Results of the experiments indicated that concentrations of Al ions in the abiotic systems remain almost constant for saturation with respect to gibbsite, suggesting the Al concentrations were controlled by solubility of gibbsite ($\log K=8.77$). On the other hand, Al concentrations of the biotic systems were increased successively with increasing bacterial amounts from 10^5 to 10^9 cells/ml. The saturation indices ($\log(IAP/K)$) were also increased up to 2.1 with increasing bacterial amounts. For organic system containing protein, it was found that protein increased greatly Al concentrations and also saturation states similarly to the biotic systems. Chemical analyses of organic molecules in solutions of biotic systems revealed that significant amounts of protein was released from the bacterial cells with small amounts of polysaccharide. Thus, the higher saturation states of the biotic systems may be caused by interaction of bacterial protein with Al ions released from boehmite. It is well known that protein molecules have strong chelate effect on complexation with various metal ions including Al.