

Observation of the dissolution/growth process of carbonate minerals by the visualization technique with the fluorescent probe

*Jun Kawano¹, Akiyuki Ueda², Takashi Toyofuku³, Yukiko Nagai³, Jun-ya Tanaka⁴, Takaya Nagai¹

1. Faculty of Science, Hokkaido University, 2. School of Science, Hokkaido University, 3. JAMSTEC, 4. Graduate School of Science, Hokkaido University

Recent progress of observation and simulation techniques has revealed that dissolution or growth process of minerals in aqueous solution cannot be explained only by simple ion-by-ion attachment/detachment. To understand these mechanisms, it should be necessary to analyze the local condition of solution just around dissolving or growing crystal. In the present study, we have tried to visualize the distribution of pH and ionic concentration around carbonate minerals dissolving/growing in inorganic environment, by using the fluorescent probe.

When calcite and aragonite dissolve in water, pH just above the surfaces increases rapidly and saturates at slightly higher value than the equilibrium pH. Distribution of pH follows the outer shape of crystals soon after the dissolution starts, and the preferential dissolution from the edge does not occur. On the other hand, in the case of dolomite, pH change is considerably slow and two dimensional feature of pH change during the dissolution is different from those of two CaCO₃ polymorphs. These kinds of tendency should strongly depend on the surface condition, such as the density of the dissolution sites (dislocations, etch pits, and so on). By combining this technique with detail observation of surface structure, new insights could be provided into the dissolution/growth mechanism of minerals.

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