

Selective interaction between aspartic acids and calcite surface

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It is known that aspartic acid (Asp)-rich peptides serve an important role in crystallization of biogenic calcium carbonate which accounts for 50% of all known biogenic minerals. Therefore, many works investigate effects of Asp in dissolution and crystal growth of calcium carbonate today. Some studies showed that Asp triggered morphological changes of etch-pit on calcite surface in the dissolution. The etch-pit morphologies changed depending on Asp concentration ($[Asp]$) in the order of rhombus, pentagon, and triangle. Additionally, other works appeared that morphologies of etch-pit developed in L-Asp or D-Asp solution are mirror images each other. These morphological changes imply selective effects of Asp to the each steps. We measured step retreat velocities and etch-pit morphologies on the calcite cleaved surface in the dissolution using AFM and confocal laser scanning microscopy (CLSM) to evaluate the effect of Asp to each steps.

AFM observations were performed using flow-through system at room temperature. Inlet solutions were adjusted to $pH = 8.0$ and $I = 0.1$ M. L-Asp concentration ranged from 0 to 0.1 M. CLSM observations were carried out on samples which had been dissolved under the same condition as the AFM observations for 30h and dried.

The etch-pit morphologies changed drastically same as previous studies. The change of obtuse step directions and appearance of the $[010]$ step triggered these morphological changes. Addition of L-Asp accelerated all step retreats at less than 0.01 M. In contrast, at more than 0.01 M, the retreats of obtuse and $[010]$ steps were inhibited by L-Asp, whereas the retreat velocities of acute steps were constant irrespective of $[L-Asp]$. From these results, it was proved that the effects of L-Asp to the obtuse and $[010]$ steps were greater than to acute steps. Same experiment about D-Asp are also carrying out soon. We will report this result in this presentation.