

## Nanoscale phenomena in the interaction between apatite and aqueous Pb

# Eigo Kamiishi[1]; Satoshi Utsunomiya[1]

[1] Dept. Chemistry, Kyushu Univ.

Apatite is a useful mineral for sequestering Pb in environments, and hydroxyapatite ( $\text{Ca}_5(\text{PO}_4)_3\text{OH}$ , HAP) is an important component of bone and teeth. In general, Pb immobilization by apatite is considered to occur via ion exchange between  $\text{Ca}^{2+}$  and aqueous  $\text{Pb}^{2+}$  or precipitation of low solubility Pb phase combined with phosphate released from apatite dissolution. In order to understand the nano-scale phenomena in the Pb immobilization process taking place in vicinity of interface, powder HAP and bulk single crystal of natural fluorapatite ( $(\text{Ca}_{4.915}\text{Na}_{0.014})(\text{P}_{3.029}\text{Si}_{0.010})\text{O}_{12}(\text{F}_{0.930}\text{Cl}_{0.098})$ , FAP) were reacted with Pb nitrate solution (2 mM) at pH of 5.0 at room temperature.

In case of bulk natural FAP, cross sectional TEM reveals that Ca selectively leached from the surface, while the secondary Pb-phosphate, chlorpyromorphite ( $\text{Pb}_5(\text{PO}_4)_3\text{Cl}$ , CPY), precipitates on the surface without the epitaxial growth. Cation exchange mechanism did not operate in the present experimental condition.

In case of powder HAP, the secondary Pb-phosphate, hydroxypyromorphite ( $\text{Pb}_5(\text{PO}_4)_3\text{OH}$ , HPY), precipitates epitaxially in parallel to b axis of HAP. Two types of mechanism were observed in the HPY precipitation; (i.) HPY precipitate on HAP from the solution supersaturated with respect to HPY; (ii.) HAP is replaced with HPY synchronizing with HAP dissolution.

The epitaxial growth was not investigated in the reaction of bulk FAP in contrast to the case in powder HAP. This is because the surface of FAP prepared by mechanical polishing is different from the euhedral crystalline face formed during crystal growth such as in HAP. The results of present study suggest that Pb immobilization mechanism strongly depends on the crystallochemistry of apatite.