

Dissolution process of the biotite (001) surface in strong acid solution: In situ observations by atomic force microscopy

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Dissolution process of the biotite (001) surface in strong acid solution was investigated using in situ atomic force microscopy. The dissolution progressed by one unit layer at the early stage of the dissolution. Many etch pits of one unit layer in depth were formed randomly on the (001) surface and the dissolution proceeded by the expansion of the pits. The dissolution rate estimated by the release of Si was about 5×10^{-10} mol/m²/sec, which is comparable to the reported value obtained using bulk specimens. Locally the dissolution proceeded with two or three unit layers.

Dissolution process of the biotite (001) surface in strong acid solution (nitric acid, pH = 1) at room temperature was investigated using in situ atomic force microscopy. The specimen is biotite from Nellor pegmatite mine, India. The chemical composition is (K_{0.80}Na_{0.11}) (Mg_{0.54}Fe_{1.60}Al_{0.57}Ti_{0.12}) (Si_{2.64}Al_{1.36}) O₁₀(OH)₂. The dissolution progressed by one unit layer at the early stage of the dissolution. Many irregularly-shaped etch pits with the depth of one unit layer were formed randomly on the (001) surface after immersion in the solution for about 16 hours, then the dissolution proceeded by the expansion of the pits. After the first unit layer was completely dissolved, new etch pits were formed on the second layer. The dissolution rate estimated by the release of Si was about 5×10^{-10} mol/m²/sec. Locally the dissolution proceeded with two or three unit layers forming deeper etch pits.