

High temperature X-ray diffraction study and TEM observation of hillebrandite, $\text{Ca}_2\text{SiO}_3(\text{OH})_2$

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Specimen used in this study was hillebrandite, $\text{Ca}_2\text{SiO}_3(\text{OH})_2$ from Fuka, Okayama Prefecture, Japan. Electron diffraction patterns of hillebrandite showed monoclinic symmetry, which is consistent to that of observed by Merlino(1997) about hillebrandite from Velardena, Durango, Mexico. Strong diffused streaks along the a^* direction were observed. Among diffused streak, some sharp spots were observed and were characterized as twinning with (100) twin plane and the polytypes that have 3a, 4a, 5a or 7a periodicity along the axis.

Thermal expansion coefficients of hillebrandite ($\text{Ca}_2\text{SiO}_3(\text{OH})_2$, $a=16.347(7)\text{\AA}$, $b=3.623(3)\text{\AA}$, $c=11.766(2)\text{\AA}$) and foshagite ($\text{Ca}_4\text{Si}_3\text{O}_9(\text{OH})_2$, $a=10.341(13)\text{\AA}$, $b=3.646(3)\text{\AA}$, $c=7.002(8)\text{\AA}$, $\beta=106.9(1)^\circ$) were examined by high temperature powder diffraction method up to 1273K. Thermal expansion coefficients of hillebrandite and foshagite were $\alpha_a=19(4)\times 10^{-6}\text{K}^{-1}$, $\alpha_b=4(4)\times 10^{-6}\text{K}^{-1}$, $\alpha_c=4(4)\times 10^{-6}\text{K}^{-1}$, $\alpha_V=27(4)\times 10^{-6}\text{K}^{-1}$ for hillebrandite and $\alpha_a=12(2)\times 10^{-6}\text{K}^{-1}$, $\alpha_b=7(2)\times 10^{-6}\text{K}^{-1}$, $\alpha_c=2(1)\times 10^{-6}\text{K}^{-1}$, $\alpha_V=25(1)\times 10^{-6}\text{K}^{-1}$ for foshagite, respectively. The least expansion was observed along the direction parallel to the SiO_3 chain and the largest expansion was observed perpendicular to the direction of SiO_3 chain in both hillebrandite and foshagite.