2a and 4a Polytypes of (Ge, Si)-Wollastonite

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Three kinds of superstructures of wollastonite whose compositions were Ca(Ge0.65, Si0.35)O3, Ca(Ge0.50, Si0.50)O3 and Ca(Ge0.15, Si0.85)O3 were synthesized. In this abstract, they are called 65Wo, 50Wo and 15Wo. The lattice constants of 65Wo, 50Wo and 15Wo are: (angstrom, degree) a=2X8.038(4), 2X7.995(2), 4X7.949(5), b=7.451(1), 7.400(1), 7.352(1), c=7.194(2), 7.148(2), 7.093(1), alpha= 89.93(2), 90.05(2), 90.06(2), beta=94.85(2), 94.97(2), 95.11(1), gamma=103.34(2), 103.43(1), 103.39(1), respectively.

65Wo consists of the neighbouring two units of the basic-wollastonite along the ***a***-axis. The X-ray diffraction pattern showed a pseudo-*C* lattice. Therefore, the stacking sequence of 65Wo can be represented as AB, where A is the unit cell of the basic-wollastonite and B is the unit cell of the basic-wollastonite with ***b****/2* displacement. The final R-value was 12%.

50Wo consists of the neighbouring two units of the basic-wollastonite along the ***a***-axis, too. However, the X-ray diffraction pattern was different from 65Wo. Judging from the characteristics of the X-ray diffraction, the stacking sequence of 50Wo is represented as AA. The final R-value was 13%.

15Wo consists of the four units of the basic-wollastonite along the ***a***-axis. There were four possible stacking sequences described as AAAA, ABAB, AABB and AAAB. The structure having the sequence AAAA will show the strong intensity on the *h*=4n diffraction. The structure ABAB will show the strong intensity on the *h*=2n diffraction. The structure AABB will show the extinction rule of the pseudo-*C* lattice. The last structure AAAB will not show any characteristic rules on the X-ray diffraction. As the result of the observation of the X-ray diffraction of 15Wo, it was clear that the stacking sequence AAAA was most reasonable. The final R-value was 14%.

In common with 65Wo, 50Wo and 15Wo, each tetrahedral site has the statistical distribution of Ge and Si atoms.

References

Buerger, M.J. and Prewitt, C.T., (1961). *Pro . Natl. Acad. Sci.USA*, **47**, 1884-1888.

Ito,T., (1950). In X-ray Study on Polymorphism. Maruzen.

Peacor D.R. and Prewitt, C.T. (1963). *Amer.Miner.* **48**, 588-596.

Temporal change of a layer sequence in reaction zones in the system dolomite – quartz – H_2O

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From an initial transient state to a steady state

Hydrothermal experiments at 0.1GPa and 600^o were carried out with two kinds of configrations for starting materials: one is dolomite single crystal + quartz powder + H_2O and the other is quartz single crystal + dolomite powder + H_2O. We got the following results. (i) Reactions were incomplete in all runs and the reaction zone developed only locally on the dolomite crystal. (ii) In short duration (45 – 71h) runs metastable layer sequences involving wollastonite and talc occur in the reaction zones, whereas they disappear in longer duration (168 – 336 h) runs. (iii) The layer sequence of the reaction zones in short duration runs differ from place to place on the dolomite crystal even in the same run. (iv) The diversity of layer sequences in the short duration runs merges into a unique layer sequence of Qtz / Di / Fo + Cal / Dol + Cal / Dol in the longer duration runs. (v) No reaction zone was observed on quartz crystals. These lines of evidence show that the system evolves from an initial transient state to a steady state and that the kinetic effect is important in the development of reaction zones. This part of the work has been recently published (Nishiyama *et al*., 2007).

Temporal change of a layer sequence at 800^{o}C

We carried out additional experiments in the same system at 0.1GPa and 800^{o}C with run durations of 48, 109 and 357 h. In these higher temperature runs reactions were complete in all runs such that the dolomite crystal was completely surrounded by a reaction zone with a definite layer sequence. Observed conspicuous features are as follows. (i) The layer sequence Dol / Dol + Cal / Fo + Cal / Fo / Mon (Monticellite) / Di / Wo / Qtz is common in all runs. (ii) The thickest layer is Di in 48 h run, Mon in 109 h run and Fo (or Fo + Cal) in 357 run. (iii) A void layer formed between Dol + Cal and Fo + Cal layers in all runs, and it becomes thicker as the duration. (iv) Reaction zones have never formed on the quartz crystal, although the quartz shows resorption after the run. These results show little change of the layer sequence but a considerable temporal change in the growth mode of the reaction zone. A steady diffusion modelling was applied to the representative layer sequence to discuss this temporal change.

Reference

Nishiyama, T., Tominaga, A. and Isobe, H. (2007) *Island Arc*,**16**, 16-27.