New finding of wakefieldite from an amphibolite in the Horokanai area, Kamuikotan HP metamorphic belt, Hokkaido, Japan

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Kamuikotan amphibolite exposed at the Horokanai area experienced transformation from amphibolite to blueschist facies metamorphism. Similar occurrences are found throughout the world, and it is generally regarded as a result of an isobaric cooling (counterclockwise) pathway. In other words, amphibolite is thought to have remained at depth and experienced cooling. To address this issue, we studied an epidote amphibolite exposed at the Horokanai hill. The rock displays a foliation consisting of hornblende/actinolite, epidote, plagioclase, rutile, white mica (Si=3.3-3.5 apfu, O=11) ±chlorite, and these primary minerals are more or less replaced by secondary blueschist facies minerals along pull apart fractures and rims of primary minerals. The latter consists of glaucophane, chlorite, titanite, epidote, pumpellyite, and white mica (Si=3.5-3.8 apfu, O=11). Yttrium vanadate (wakefieldite) grains occur along pull apart fractures of epidote and hornblende, and the remaining fractures were filled by phengite rich white mica. This suggests wakefieldite was formed before or during blueschist facies metamorphism. According to previous studies, wakefieldite could be stable under ultraoxidation conditions at shallow depths. Following this idea, it is unlikely that the Kamuikotan amphibolite was transformed into blueschist by isobaric cooling at depth, but rather once exhumed to shallow depth and sunk back to the depth.

Keywords: Kamuikotan metamorphic belt, yttrium vanadate, wakefieldite-(Y), P-T-t path