

Petrological study of barroisite-bearing metabasite from the Kebara formation in NW Kii Peninsula and its significance

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The chemical composition of minerals is generally controlled by several factors such as *P-T* conditions and bulk composition. Barroisite (Brs) is an intermediate amphibole between glaucophane and tschermakite and its ideal chemical formula is $(\text{NaCa})\text{Mg}_3\text{Al}_2(\text{Si}_7\text{Al})\text{O}_{22}(\text{OH})_2$. In the Sambagawa belt of central Shikoku, Brs is reported from the higher grade zones, such as the Grt and Ab-Bt zones, and eclogite units. On the other hand, sodic-amphibole, winchite (Wnc), and actinolite (Act) are common in the lower grade zones such as the Chl to Grt zones and the Mikabu belt. In this study, we report the first finding of Brs in metabasite from the Kebara Formation in the NW Kii Peninsula, and discuss its significance. The Kebara Formation is an E-W trending geological unit, 5x1 km, exposed between the Sambagawa and Chichibu belts (Kurimoto, 1986). The Kebara Formation is mainly composed of metapelite with minor amount of lenses or layers of metabasite and siliceous schist (Kurimoto, 1986). Mineral assemblages reported from the Kebara Formation are quartz + albite + chlorite + phengite + lawsonite + calcite in metapelite and lawsonite + pumpellyite + actinolite or sodic-amphibole + pumpellyite + sodic pyroxene + epidote in metabasite (Kurimoto, 1986; Tomiyoshi & Takasu, 2005, 2009). These mineral assemblages are stable from a high-*P* part of the pumpellyite-actinolite (PA) facies to a low-*P* part of the epidote-blueschist facies. Although the Kebara Formation is regarded as the Mikabu belt (Kurimoto et al., 1998; Makimoto et al., 2004), its main lithology differs from that of other areas in the Mikabu belt. Brs-bearing metabasite was collected from a continuous, 30m-long outcrop along the Takino-gawa in the SW part of the Kebara Formation. The outcrop exhibits a change from metabasite in the north to metapelite in the south. The main foliation shows ENE-WSW strike and steeply dip to the south. Brs-bearing metabasite, more than 70 cm in thickness, occurs at the transition between metabasite- and metapelite-dominated parts, and its main foliation is consistent with that of the surrounding rocks. Brs-bearing metabasite consists of mm-thick blue-green epidote-rich layers alternating with blue amphibole-rich layers. The blue-green layers are mainly composed of epidote, amphibole, chlorite, white mica, albite, and quartz with minor amount of titanite and apatite. The blue layers contain sodic pyroxene in addition to the above mentioned minerals. Many amphibole grains show a distinct zoning pattern characterized by a Brs core, a sodic amphibole mantle, and a Wnc rim with distinct compositional gap. In some amphibole grains, sodic amphibole and Wnc repeatedly appear at the margin of Brs. Various zoning types of amphibole were reported in the Sambagawa belt: Brs-hornblende(-Wnc)-Act from the Grt and Ab-Bt zones in the Asemi-gawa and Dozan-gawa areas, Brs-sodic amphibole-Wnc/Act from the Ab-Bt zone in the Saruta-gawa area (Otsuki & Banno, 1990; Y. Banno, 2000; Okamoto & Toriumi, 2004). Most of these zoning patterns are attributed to *P-T* changes during the exhumation stage, *i.e.*, a decompression with a significant cooling path in the Saruta-gawa area (Y. Banno, 2000) and an isothermal decompression path at an early stage of the exhumation in the Asemi-gawa and Dozan-gawa areas (Okamoto & Toriumi, 2004). The amphibole zoning pattern identified in this study is similar to that of the Saruta-gawa area except for the lack of hematite. This fact suggests that the study samples experienced the epidote-amphibolite facies prior to the PA facies. Multiple recrystallization can be explained by so-called Yo-Yo subduction as reported in the Italian Western Alps (*e.g.* Rubatto et al., 2011).

Keywords: barroisite, the Mikabu belt, the Kebara formation, Kii Peninsula, metabasite, Yo-Yo subduction