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Metamorphism of sodic pyroxene-bearing quartz schists from the Bizan area, Sambagawa belt, eastern Shikoku, Japan

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The Bizan area of the Sambagawa metamorphic belt is occurs in easternmost Shikoku, southwest Japan. The Bizan and Kotsu areas are located in the same tectonostratigraphic horizon, i.e. the Kotsu Formation in eastern Shikoku. The Kotsu Formation in the Kotsu-Bizan area is structurally overlying and underlying by the Kawata Formation and the Kawatayama Formation, respectively. The main rock types in the Bizan area include pelitic, basic and siliceous schists, with minor amounts of psammitic and calcareous schists (Iwasaki, 1963). Faure (1983) suggested a melange zone containing tectonic blocks of serpentinite, metagabbro and garnet-amphibolite (garnet-glaucophane schist) occurs along a ductile shear zone between spotted and non-spotted schist zones. Sodic pyroxene-bearing quartz schists consist mainly of quartz and phengite, with minor amounts of amphibole (Fgl, Mrbk, Rbk, Mkt, Wnc, Brs, Fbrs), garnet, Na-Ca pyroxene (hereafter sodic pyroxene) (aegirine, aegirine-augite and omphacite) and albite. Hematite, chlorite, and epidote occur occasionally. A schistosity is defined by preferred orientation of phengite and quartz.

Garnets are spessartine-rich in composition, show a growth zoning with decreasing spessartine (X_{Sps} 0.82-0.35) and increasing almandine (X_{Alm} 0.01-0.41) and pyrope (X_{Prp} 0.03-0.09) from core to the rim and contain inclusions of phengite (6.84 pfu), epidote, hematite and quartz. The garnets are occasionally replaced by chlorite and biotite along cracks and at the rims. Amphiboles occurring as inclusions in porphyroblastic albite are compositionally zoned, with Fbrs and Brs cores and Rbk rims. Matrix amphiboles are Brs and Mkt core, Fgl mantle and Rbk and Mrbk rims, and contain inclusions of phengite (6.50-6.51 pfu), hematite and quartz. Sodic pyroxenes occurring as inclusions in porphyroblastic albite are aegirine, aegirine-augite and omphacite with X_{Jd} 0.08-0.37 contents. Some of them are compositionally zoned, with aegirine-augite and omphacite cores (X_{Jd} 0.34-0.37) to aegirine-augite and aegirine rims (X_{Jd} 0.34-0.21). Matrix sodic pyroxenes are aegirine-augite (X_{Jd} 0.09-0.27), decreasing X_{Jd} from cores (0.22-0.25) to the rims (0.22-0.17). Some other sodic pyroxenes in the matrix display increasing X_{Jd} from core to the mantle (0.13-0.19) and decreasing towards the rim (0.19-0.12). They contain inclusions of amphibole (Brs, Fbrs, Rbk), phengite (6.66-6.82 pfu), hematite and quartz, and are partially replaced by chlorite along their cleavages. Porphyroblastic albite crystals up to 2 mm across contain inclusions of garnet, amphibole (Brs, Fbrs, Rbk), sodic pyroxene (X_{Jd} 0.10-0.37), phengite (6.57-6.76 pfu) and quartz. Matrix phengites show relatively higher in Si (6.33-6.98 pfu) contents than inclusions.

According to the occurrence of mineral assemblage the Kwata, Kotsu and Kawatayama Formation probably correlate with the albite-biotite zone of the Besshi area (Enami *et al*., 1994). Jadeite content in the sodic pyroxenes are significantly higher in sodic pyroxene-bearing quartz schists (X_{Jd} 0.08-0.37) than those of garnet-aegirine augite-alkali amphibole-quartz schist (X_{Jd} 0.30) in the Bizan area (Iwasaki, 1963) and Asemigawa (X_{Jd} 0.15-0.19), Besshi (X_{Jd} 0.14-0.23) and the Sarutagawa area (X_{Jd} 0.17-0.30) in the central Shikoku (Enami *et al*., 1994). This higher jadeite content in sodic pyroxenes suggests metamorphic conditions in the Bizan sodic pyroxene-bearing quartz schists might be higher in pressure than those of the metamorphic zonation in the albite-biotite zone of the Sambagawa belt central Shikoku by Enami *et al*. (1994).

References

Enami *et al*. (1994) *Contrib Mineral Petrol*, 116, 182-198. Faure M. (1983) *J Geol Soci Japan* 89, 319-329. Iwasaki, M. (1963) *J Faculty of Science, Univ Tokyo, Section II*, 15, 1-90.

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