Eclogitic pelitic schists from the Sebadani area in the Sambagawa metamorphic belt, Besshi district, central Shikoku, Japan

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Omphacite and glaucophane-bearing pelitic schists occur in the Sebadani area, Besshi district, central Shikoku, Japan. The occurrence of eclogitic basic schists has already reported from the area (e.g. Takasu, 1994; Aoya, 2001).

Porphyroblastic garnets in the pelitic schists display prograde growth zoning and contain inclusions of amphiboles (e.g. Gln, Brs, Mg-trm and Mg-hbl), albite, epidote, phengite, paragonite, hematite, titanite, chlorite, calcite and quartz. Polycrystalline quartzs included in garnets display radial cracks probably suggesting a UHP condition. The peak metamorphic conditions are defined by the schistosity-forming minerals consisting of the rim of the porphyroblastic garnet, barroisitic amphibole, epidote, phengite, rutile and quartz.

Porphyroblastic garnets are partly replaced by symplectite of amphibole (e.g. Brs, Mg-ktp, Mg-hbl and Act) and albite suggesting retrograde metamorphism. Omphacite (XJd 0.30-0.35) occasionally occurs as a constituent of albite-hornblende symplectite.

Some randomly oriented amphiboles together with small amounts of epidote, albite, chlorite and biotite are cross-cut the matrix schistosity. The mantle amphibole is zoned from resorbed Brs core through Gln mantle to Brs/Mg-trm rim. Coexisting the rim of the amphibole (Brs/Mg-trm), and epidote, chlorite, biotite and hematite, suggests the peak metamorphic assemblage of this metamorphic event. The Brs/Mg-trm is rimmed by Act suggesting a retrograde metamorphism.

Textural relationship, mineral assemblage and thermobarometric result suggest a polyphase tectonometamorphic evolution. There are two contrasting, regionally significant, tectono-metamorphic events. The 1st metamorphic event is prograde development from the epidote-blueschist or epidote-amphibolite facies conditions to the eclogite facies. 480-515 deg C and c. 6 kbar (Laird, 1988 and Gambling, 1990) are suggested as the pre-peak conditions. The peak eclogite facies conditions are T=630-655C and P=18.5-21 kbar (garnet-amphibole-phengite-epidote assemblage, by THERMOCLAC), and they follow a clockwise decompression path. The retrograde stage after the peak metamorphism is estimated as T=510-520C and P=5-6 kbar (Laird, 1988 and Holland and Blundy, 1994) represented the epidote-amphibolite facies conditions.

The 2nd metamorphic event, prograde metamorphism deduced from the randomly oriented amphiboles is the epidote-blueschist facies (T=360-540C P=8-18 kbar; Evans, 1990) to the peak metamorphic conditions of the epidote-amphibolite facies (T=530-580C at 6-8 kbar, by THERMOCLAC) and retrograded to the lower epidote-amphibolite/greenschist facies (T=480-500C and P=4-5 kbar; Holland and Blundy, 1994 and Brown, 1977). The 2nd metamorphic event also follows a clockwise P-T path, but it is different from the 1st metamorphic event because of the prograde metamorphic path of isobaric heating or heating with decreasing pressure.

The Onodani area is located close to the Sebadani area in the Besshi district and both eclogite localities in the Onodani and the Sebadani areas are situated within the same basic schist unit (e.g. Takasu and Makino, 1980). The Onodani eclogites experienced three folds prograde metamorphism (Kabir and Takasu, 2008). The 1st high-pressure eclogite facies metamorphism is deduced from the minerals preserved in the spessartine-rich core of the porphyroblastic garnet. The 2nd high-pressure metamorphic event is deduced from the schistosity forming mineral assemblages. The 3rd high-pressure metamorphism is deduced from the amphibole-rich vein or randomly oriented amphiboles. The 2nd and the 3rd high-pressure metamorphic events are correlated to those of the 1st and 2nd high-pressure metamorphism of the Sebadani pelitic schists.