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Optically sector-twinned spessartine garnet from a piemontite quartz schist in the Asemi-gawa area of the Sanbagawa metamorphic belt, central Shikoku, Japan

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Abstract : Optically sector - twinned garnet was found in a piemontite quartz schist in the Asemi-gawa area from the Sanbagawa metamorphic belt. The Sanbagawa metamorphic belt was formed during a regional Cretaceous intermediate high pressure type of metamorphism which is present through Southwest Japan. The garnet contains abundant inclusions of piemontite, quartz, hematite, braunite, talc and sodic amphibole. It is almost homogenous spessartine garnet (X_{Sps} = 0.85). Piemontite occurs both in matrix and as inclusion in garnet and albite and it usually shows distinct zonation in which core of the grain contains lower Fe^{3+} and higher Mn^{3+} - and Al-contents than those of the rim. The garnet is anisotropic and composed of several parts or sectors visible in crossed polars. They show different patterns such as octahedral, hexahedral and tetrahedral in which optical orientation and extinction position are roughly symmetrical. A rhombododecahedral model garnet was used to interpret the geometry of the optically sector structure and show that sectors with symmetrical Miller's indices have similar optical properties. Textural relation and systematic partitioning of Mn^{3+} , Fe^{3+} and Al among garnet, piemontite and braunite indicate that garnet formation is due to the piemontite and braunite reaction.