Large zircon (Zrn) porphyroblasts (< 3 mm) occur in jadeite (nearly monomineralic jadeite-rich) rock of the Osayama serpentinite melange (OSM), northern Okayama Prefecture. The OSM is a serpentinite-matrix melange containing blocks and veins of high-P rocks (e.g., blueschist, jadeiteite, omphacitite) and low-P rocks (e.g., rodolite, albititite)\textsuperscript{[3,5]}. The protolith of the serpentinites was moderately-depleted harzburgite and minor cumulus dunite\textsuperscript{[3,5]}. Jadeite veins in rocks are formed mainly of jadeite (Jd) (generally more than 75% by volume) with minor amounts of grossular (Grs), and trace rutile (Rt) and Zrn\textsuperscript{[3,5]}. The Jd-rich matrix is heterogeneous and shows variable contents of retrogression; omphacite, analcime, pectolite, stronalsite, thomsonite, natrolite, vesuvianite, prehnite, phlogopite, deweylite and titanite are retrograde phases\textsuperscript{[1,3]}. Zircon occurs as discrete euhedral to subhedral crystals, as twinned crystals, or aggregates in the matrix; Zrn contains tiny inclusions of Rt and rare Jd. Fine-grained Zrn also occurs as inclusions in a single Jd crystal\textsuperscript{[3]}. Textural relations indicate syn-metamorphic, simultaneous growth of Zrn with Jd from serpentinite-related hydrothermal fluid. Primary mineral assemblage consisting of Jd + Grs + Rt and the existing fluid-inclusion data\textsuperscript{[7]} constrain a P-T condition of the jadeite formation at P ∼ 1-2 GPa and T < 350 °C. Preliminary U-Pb ages of the Zrn porphyroblasts using conventional thermal ionization mass spectrometry yield c. 450-500 Ma\textsuperscript{[8]}, these data were interpreted as the crystallization age of an igneous protolith for the jadeite.

Zircon porphyroblasts analysed by SHRIMP-RG in this study are characterized by low Th- and U-abundances (Th = 1-51 ppm; U = 6-149 ppm). Textural and geochemical features define three zones: normal growth zone with Th/U ratio of 0.2-0.5 (Type I), texturally inherited zones with Th/U ratio of 0.7-0.8 (Type II), and replacement zone (Type III). The ratio of common Pb to radiogenic Pb is clearly high (10-26 %) in Type III zones, whereas other zones are less than 5.4 % (mostly < 0.5 %). When Type III zones in zircon crystals are excluded, the remaining zones in zircon crystals yield a homogeneous age population with a weighted mean of 206\textsuperscript{Pb}/238\textsuperscript{U} spot ages of 476 ± 10 Ma (n = 34). Since Zrn porphyroblasts contain high-P mineral inclusions, the U-Pb age represents the time of jadeite formation, i.e., the timing of interaction between alkaline fluid and ultramafic rocks in a subduction-zone, and constraints the minimum age for serpentinitization. The jadeite formation is significantly older than phengite K-Ar ages\textsuperscript{[20]} of the OSM blueschists (273-327 Ma). This relationship suggests the jadeite formation is not related to regional Late Paleozoic blueschist metamorphism. The jadeite formation and serpentinitization may instead be related to Early Paleozoic high-P epidote-amphibolites with hornblende K-Ar age of 403-443 Ma in a serpentинized peridotite body in the eastern Chugoku Mountains, about 180 km to the east of the OSM\textsuperscript{[9,10]}. Despite Zr-depleted environments, serpentinites is a unique environment for precipitation of hydrothermal zircon. Similar Zrn occurrence has been reported from serpentinite-related low-T metasomatic rocks such as rodingite blackwall and jadeite\textsuperscript{[11-14]}, reconnaissance U-Pb dating for such low-T Zrn has just began\textsuperscript{[12,14,15]}. U-Pb ages of zircon in jadeite associated with serpentinite are significant to constrain the timing of fluid-rock interactions of ultramafic rocks.

REFERENCES


Keywords: serpentinite; jadeite; zircon; U-Pb geochronology; fluid-rock interaction

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