$^{87}Sr/^{86}Sr$ of mafic microgranular enclaves in the Inagawa Granite, Ryoke belt, southwest Japan

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The Inagawa Granite is located in the eastern part of the Cretaceous Ryoke metamorphic belt, southwestern Japan. The radiometric ages of the Inagawa Granite are: 63 – 72 Ma by K-Ar biotite method [1], c. 77 Ma with an initial $^{87}Sr/^{86}Sr$ ratio (SrI) = 0.7095 by Rb-Sr whole-rock isochron method [2], 71.5 ± 2.4 Ma, 63.0 ± 2.0 Ma and 67.4 ± 1.4 Ma by Rb-Sr mineral whole-rock isochron method [3], and 81.9 ± 1.4 and 82.6 ± 1.8 Ma by CHIME monazite method [4].

The Inagawa Granite in the study area (Asuke area) is divided into four intrusive units; Type I (medium-grained hornblende-biotite tonalite, granodiorite and monzogranite), II (coarse-grained porphyritic hornblende-biotite granodiorite and monzogranite), III (coarse-grained hornblende-biotite granodiorite and monzogranite) and IV (coarse-grained hornblende-bearing biotite monzogranite) [5]. Sr isotopic study of apatite revealed the initial $^{87}Sr/^{86}Sr$ ratio heterogeneity (SrI = 0.7093 - 0.7107) within the pluton [3].

Type I and II granite often contains mafic microgranular enclaves (MME) of diorite. The enclaves are irregularly shaped and vary from 3 to 16 cm across. The boundary between host granite and the mafic enclaves is gradual. The enclave consists of subhedral to anhedral phenocrysts of plagioclase in a matrix dominated by plagioclase, quartz, biotite and clinopyroxene. In this study, $^{87}Sr/^{86}Sr$ ratios of mafic microgranular enclaves are determined to reveal the origin of MME and detailed magma processes of the pluton.

Initial $^{87}Sr/^{86}Sr$ ratio of the enclaves varies from 0.7086 to 0.7094. Combining initial Sr isotopic studies of MME with bulk rock analyses and field observations strongly supports the model [3] that the initial $^{87}Sr/^{86}Sr$ ratio heterogeneity within the pluton is caused by "high-SrI acidic magma" and "low-SrI mafic magma" mixing.

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Large-scale fluid flow in a cold subduction-zone: SIMS Li-isotope study of jadeitite veins in Franciscan metagraywacke

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Blueschist-facies metagraywacke blocks in the New Idria serpentinite body—the on-land analogue of active serpentinite diapirs in present-day forearc environments— of the Diablo Range, California have experienced fluid infiltration involving crack-seal jadeitite vein formation at HP-LT conditions (P> 1 GPa at T= ~250-300 °C: Tsujimori *et al*., 2007). The veins form as jadeite precipitates in the mm- to several cm-wide fractures cutting host metagraywacke and show elongate-blocky and/or radial microstructure with euhedral crystal terminations (Coleman, 1961). A single micro zircon in the vein yielded a SIMS U-Pb age of 129 Ma, which is similar to the timing of Franciscan blueschist metamorphism. The coarse-grained jadeite crystals in the vein are up to 99 mol.% jadeite with trace amounts of Sr (0.16-1.0 ppm), Zr (1.7-3.0 ppm), Ba (0.4-8.3 ppm), REEs (< 0.1 ppm) and Li (1.4-11 ppm). Crystal sections cut perpendicular to the c-axis exhibit concentric Li abundance oscillations. This growth pattern indicates rapid growth of jadeite from aqueous fluid without diffusional homogenization of Li either during or after the vein-formation. *In situ* SIMS Li-isotope analyses of jadeite in the veins gave very light δ^7Li values (-33 to -25‰). The δ^7Li value tends to be consistent despite changes in Li concentration from 1 to 10 ppm; the lightest recorded δ^7Li is found at the rims. This very light Li-isotopic composition excludes seawater as a possible jadeitite-forming Na-rich fluid. The lack of evidence for diffusion also excludes diffusion-induced Li-isotope fractionation as an explanation for the light δ^7Li values. The Li-isotope fractionation factor (Wunder *et al*., 2006) between clinopyroxene and LT fluids require a jadeitite-forming fluid with a very light Li-isotope composition (~-27‰) at forearc depths. Consequently, we propose a large-scale fluid flow in a cold subduction zone, in which the slab-derived Na-rich fluids with very low δ^7Li from great depths can be transferred to the forearc environment along the slab-mantle interface; the deep fluids produce the jadeitite veins with very light δ^7Li value in a blueschist grade subducting slab at forearc depths. Although the investigated jadeitite vein itself does not represent a perfect original fluid composition, Li-isotope studies of HP-LT metamorphic veins can result in new insights into large-scale fluid dynamics in subduction-zones.

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