Geochemical study of P-type jadeitites (jadeite precipitates) from the New Idria serpentinite body, California

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P-type (fluid precipitation) jadeitite (Tsujimori and Harlow, 2013) is an excellent media to decipher subduction zone fluids and fluid-induced geochemical processes. As the best example of P-type jadeitite, veined jadeitite from the New Idria serpentinite body of the Diablo Range (California, U.S.A.) was investigated. Vein-network textures and growth textures of oscillatory-zoned jadeite crystals suggest that the jadeitite suffered brittle deformations and subsequently brittle microcracks were filled by jadeite precipitates repeatedly. An integrated study of LA-ICPMS trace elements and lithium isotope geochemistry constrain a property of jadeitite-forming high-pressure/low-temperature aqueous fluids and a possible scenario for formation of the veined jadeitite. Compositions of the jadeitite-forming fluids estimated using partitioning coefficients between clinopyroxene and fluids have trace element patterns similar to experimentally-determined fluids in equilibrium with coesite-bearing metasedimentary rocks. In-situ analyses confirmed a wide variation of isotopic composition (from −12 to +7 permil) and abundance (4–68 μg/g); those values show a systematic distribution fitting a curve led by the fluid–rock interaction equation. Geochemical data suggest that deep fluids enriched with some specific elements and light lithium might have migrated to forearc depths along slab–mantle interface from a great depth. During the migration/upwelling process, fluids interacted substantially with various metamorphic rocks in the interface. Various degrees of fluid–rock interaction and stepwise fluid infiltration at forearc depth recorded in New Idria jadeitite give new insights into the behavior and dynamics of aqueous fluids in subduction zone.

Keywords: jadeitite, lithium isotope, subduction zone

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