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SIMS OXYGEN ISOTOPE ANALYSES OF JADEITITE: TRACE ELEMENT CORRELATIONS, FLUID COMPOSITIONS, AND TEMPERATURE ESTIMATES

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Rare bodies of jadeitite (aggregates of near-end-member jadeite) represent variably deformed and recrystallized, fluid-deposited vein systems in HP/LT serpentinite-matrix mélanges. Because mineral $d^{18}O$ signatures can yield fluid source characteristics, we analyzed oxygen isotopes in cathodoluminescence (CL)-zoned jadeitite samples, previously analyzed for trace elements by SIMS.

Twenty $\delta^{18}O$ analyses were made for 6 jadeitites from Guatemala, California, Japan, Burma, and Kazakhstan. Separates from 2 samples and Eiler et al.'s (1997) jadeite standard were also analyzed by laser fluorination. Four samples yielded $\delta^{18}O$ from 8.18 to 9.89‰; two ranged from 4.45 to 7.07 ‰. Two samples are zoned in $\delta^{18}O$: in CJ-01 (Burma) bright green-CL zones (4.9 ‰; rich in Li, Rb, Ti, MREE, Zr) contrast with blue-CL zones (8.89 to 9.33 ‰, rich in Be); in sample 112552-1, (Japan), a bright green (4.45 ‰, rich in Li, Be, REE, Zr) zone again contrasts with red-blue zones (6.22 to 6.62 ‰, rich in Rb). Separates from 112552-1 yield $\delta^{18}O$ of 6.63 to 7.07‰. T-estimates based on $\delta^{18}O$ exchange between albite and jadeite range from 299° (CJ-01, Burma) to 414°C (112538, Guatemala), consistent with jadeitite-forming Ts predicted by phase equilibria and fluid inclusion data.

As has been shown for other minerals, SIMS detects large variations of $\delta^{18}O$ within (in this case, trace element- and CL-) zoned grains, which may go unnoticed in whole-rock samples or mineral separates. Globally, jadeitite-forming fluids apparently differ by as much as 5‰ in their $\delta^{18}O$ values. Jadeitite-forming fluids with such distinct $\delta^{18}O$ characteristics may have originated from different depths within subducting oceanic crust (e.g., pillow basalt versus gabbro) that underwent seafloor alteration at different temperatures, as is documented for high P/T meta-ophiolitic terrains.