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# Developments in scheelite geochronology: a case study of Yellow Pine pit scheelite near Stibnite, Idaho, USA

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Recent successes with characterizing scheelite from the Yellow Pine pit of the Stibnite mining area in central Idaho, USA, allow these crystals to be used as a natural matrix-match standard material for in situ laser-ablation U-Pb geochronology. The Yellow Pine pit ore body has scheelite with moderate U concentrations (up to 20 ppm) and very low initial Pb contents, likely due to chalcophile partitioning into co-existing stibnite.

Characterization of Yellow Pine pit scheelite was accomplished via isotope dilution thermal ionization mass spectrometry and laser ablation inductively coupled plasma mass spectrometry. Scheelite crystals separated via SELFRAG dissaggregation were spiked with a mixed U-Pb tracer and completely dissolved with concentrated HCl at 180°C for 48 hours to ensure sample-spike equilibration. U and Pb were separated and purified using anion exchange chromatography. The resulting U-Pb scheelite ID-TIMS age based on a “Total-Pb” 3-D Tera-Wasserburg regresssion is 57.52 ± 0.22 Ma.

Multiple independent scheelite laser ablation experiments were conducted to characterize the inter-element fractionation behavior of scheelite compared to silicate glass standards and also to evaluate the homogeneity of the Yellow Pine scheelite. The relative fractionation factor between scheelite and glass was consistent during our experiments. Unlike most minerals and glasses, scheelite exhibits a preferential sampling and transport of uranium over lead. Subsequent experiments on the same scheelite samples—but using the Yellow Pine pit scheelite as a direct matrix-match standard—yield identical ages within uncertainty to previous scheelite experiments. This demonstrates the reproducibility of the calibration strategies and viability of the Yellow Pine pit scheelite as a natural matrix-match scheelite standard for in situ U-Pb geochronology.