In-situ split stream Sm-Nd dating and trace element analysis of scheelite via LA-ICPMS

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Samarium–Nd isotope dating of scheelite mineral separates is an established method of constraining the timing of mineralization. Here, we show the successful application of in-situ split stream LA-ICP-MS Sm-Nd isotopes and trace element abundances to determine scheelite paragenesis within a small greisen type scheelite deposit associated with a granodiorite at Canaan Downs, New Zealand. Scheelite mineralization is hosted within ~2 meter-wide quartz-phengite veins that cut through the host granodiorite. Chondrite-normalized scheelite trace element patterns show bell-shaped curves with a minor to no Eu anomaly and are indicative of formation from a fluid that has undergone no significant fractionation during scheelite precipitation. The mean average concentration of neodymium is 485 ppm raging between 159 and 1330 ppm and of samarium is 164 ppm ranging between 49 and 670 ppm. 147Sm/144Nd ratios range from 0.10 to 0.29 and 143Nd/144Nd ratios range between 0.5123 and 0.5127. The analyses resolve an Sm-Nd isochron age of 327 + 36 Ma with an MSWD of 5.2 and initial 143Nd/144Nd at 0.512124 + 0.000045. This age overlaps with a U-Pb zircon age of 350.8 + 4.5 Ma from the host granodiorite and provides an independent check on the validity of the Sm-Nd date. Although the uncertainty of the Sm-Nd age is high, this work indicates that LA-ICPMS can broadly date ore genesis events while retaining crucial textural information.