

U-Pb dating of columbite-bearing ores with a new columbite reference material

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Columbite-bearing ores are very difficult to date by conventional LA-ICP-MS U-Pb geochronology using technique as there are no matrix matched standard reference materials known (SRM). Several publications recently presented LA-ICP-MS ages of columbite, using zircon as the primary SRM (Che et al., 2019), however zircon, monazite or other usual SRMs are most often lacking in columbite-tantalite ore bearing veins and rocks.

We investigated several SRMs to date columbite by the LA-ICP-MS U-Pb method, including zircon GJ-1 and the NIST610 glass. Due to differences in laser-induced element fractionation and/or matrix effects, we observed inaccuracy of columbite U-Pb dates by up to 10% applying these non-matrix matched SRMs. Our project therefore aims at characterizing a new homogenous columbite reference material for U-Pb dating using the LA-ICP-MS and ID-TIMS techniques.

Preliminary results show that 2 to 4 homogeneous single crystals (selected out of more than 20 localities) are potentially suitable columbite SRMs. These show Pb_{rad}/Pb_{com} ratio and U content of 12.5 - 0.85 and 44 - 420 ppm respectively. The $^{206}Pb/^{238}U$ ratios and corresponding ages reveal a 1 % uncertainty (SD). Our new SRM was tested on columbites from several deposits in Colombia and Argentina. The results show that using the new SRMs the columbite U-Pb dates are concordant and well defined with usual uncertainty less than 2%. They encourage the potential application of this techniques and SRMs for dating of similar type of deposits over the world.

Che, X.D. et al. (2019), *Ore Geolpgy Reviews*, 105, 71-85.