Cassiterite as a Reliable *in situ* LA-ICPMS U-Pb Geochronometer of Ore Deposits: Examples Spanning the Archean to Tertiary

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Precise and accurate dating of cassiterite (SnO_2) is required for direct age determination of tin and associated rare-metal ore deposits. In situ analysis is the preferred analytical method because of the difficulty of complete digestion that is needed for TIMS dating of cassiterite. Our new approach for *in situ* LA-ICPMS dating of cassiterite (Neymark et al., 2018) is based on the negligible Th content in some samples. Accordingly, ^{208}Pb measured in cassiterite can be used as a proxy for common Pb. The raw data collected using 193 nm laser ablation/ single-collector ICPMS are reduced using Iolite™ and normalized using NIST 612 glass as a primary non-matrix-matched standard.

We analyzed cassiterite from different types of worldwide tin deposits (placer, disseminated in granite, pegmatitic, greisen, skarn). U concentration (~3 to ~50 ppm) and relative abundance of non-radiogenic common Pb in cassiterite samples (~0% to >90%) are highly variable and influence the precision of age determinations.

Cassiterite ages were obtained for samples from tin deposits at Llallagua, Bolivia (~20 Ma), Chukotka, Russia (~107 Ma), Jiangxi, China (~157 Ma), Cornwall, UK (280-290 Ma), Logrosán, Spain (~320 Ma), Silsilah, Saudi Arabia (~600 Ma), Rondônia, Brazil (~1.01 Ga), Pitkäranta, Russia (~1.54 Ga), Eastern Siberia, Russia (0.72 to 1.82 Ga), Pitinga, Brazil (~1.83 Ga), Rooiberg and Zaaiplaats, Bushveld, South Africa (~2.06 Ga), Tanco, Canada (2.66 Ga), and Sinceni, Swaziland (~3.04 Ga). Preliminary results were also obtained for cassiterite in SEDEX and VMS deposits (Sullivan, Canada, and Neves Corvo, Portugal, respectively).

The U-Pb ages are in good agreement with published ages of rocks associated with the deposits thus validating our methodology. We conclude that cassiterite is a reliable U-Pb mineral-geochronometer. LA-ICPMS dating has advantages of fast, low cost, *in situ* analysis and good spatial resolution.

Reference

L.Neymark, C.Holm-Denoma, R.Moscati, Chemical Geology, 2018, in press