

### **LA-ICP-MS U-Pb Dating of Garnet From Tertiary Skarns in the Eastern Basin and Range, USA: Implications for Metallogeny and Geodynamics**

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This study uses LA-ICP-MS (Laser Ablation – Inductively Coupled Plasma – Mass Spectrometry) U-Pb garnet dating to directly date hydrothermal skarns, thereby obtaining ages for skarns and their causative intrusions in the eastern Basin and Range Province, western Utah. To ensure the dating quality, the commonly used reference materials (RM) proposed for garnet dating, Willsboro, Mali, Jumbo, Tiptop, QC-04 and PL-57, are evaluated. It is found that no RMs are perfect. Willsboro analyses are mostly concordant and suitable for primary RM, but the different chips have different ages due to its metamorphic nature. Mali grains also have different ages as they are alluvial. Extensive testing was conducted to find the suitable Willsboro grain (s) for the primary RM, and Jumbo and Tiptop grains as secondary RMs. Magmatic hydrothermal deposits including skarns in western Utah occur in three east-west belts. The quality of the garnet dating of Tertiary skarns in western Utah is verified by the dating of secondary RMs and the comparison with known hydrothermal ages where available. The results of 14 skarns reveal clear younging trends from north to south across the three belts, and from west to east in each belt, from ca. 40.0 to 15.5 Ma. An explanation for the younging trends is the time-transgressive eastward advancement of the Farallon slab subduction. The slab roll back occurred after the skarns, rather than being related to some skarns such as Bingham as proposed before. The discrete belts may have been caused by tears of the subducting slab, which could be the results of sea ridges and/or transform faults in the subduction slab, and/or uneven features in the block above the slab such as sutures, as is potentially the case for the Bingham-Park City belt overlying the east-west Uinta-Cortez Axis.