Laser Microprobe (U-Th)/He Dating of Titanite

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A recent advancement in the evolution of (U-Th)/He thermochronology has been the application of laser technologies for high spatial-resolution dating. Thus far, excimer laser microprobes have been used successfully to date high U+Th minerals such as monazite and zircon in prepared grain mounts [1-4], and to elucidate helium diffusion profiles in apatite [5]. As demonstrated by Tripathy-Lang *et al*. [4], the laser microprobe method is an especially powerful tool for detrital zircon dating; however, other detrital minerals may be amenable to this method as well. Here we report preliminary results of an ongoing study of the viability of laser microprobe (U-Th)/He dating of titanite. While titanite contains lower concentrations than zircon of parent isotopes and consequently less radiogenic ^{4}He, its typically larger grain size also allows for these characteristics to be mitigated by the use of larger laser beam diameters during the ablation process. Using example analyses of a variety of titanite materials, we illustrate necessary adaptations of previously described protocols [1-4] for titanite dating, practical implications for sample selection, and the typical precision of derived (U-Th)/He dates. Ultimately, with judicious analytical protocols, integrated laser microprobe U/Pb and (U-Th)/He dating of detrital titanite can be a valuable tool for identifying the provenance of sedimentary successions and the exhumation history of the source region.

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