

The promise and pitfalls of microsampling Lu-Hf garnet geochronology

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The technique of microsampling, such as micro-drills and micro-saws, is an intriguing approach for unraveling the growth pace of garnet as well as the dynamics of tectonic and petrologic processes. Microsampling method so far has been successfully used for Sm-Nd and Rb-Sr garnet geochronology, yet, the difficulties of this method for Lu-Hf garnet system remain unresolved. The micro-zircon inclusion in garnet and the relatively large amount of materials needed for Hf analysis, are the two barriers to applying microsampling for Lu-Hf garnet geochronology. Here, we present several Lu-Hf dates from distinct zones of a single large garnet by conventional microsampling method. Two large garnet porphyroblasts of several centimeters in diameter, comprised of dark cores and pale rims, were studied. Elemental compositions and mineral inclusions in the garnet indicate two garnet generations. Lu-Hf dates of ~400 to 264 Ma were obtained from twelve micro-sawed sections from the porphyroblasts. These Lu-Hf dates were interpreted to bracket the period of garnet growth. The spread from 400 to 264 Ma is interpreted by a protracted and episodic garnet growth, which suggests two subduction cycles for the host rocks. Microsampling Lu-Hf geochronology of consecutive garnet shells is a promising approach to deciphering the growth rates of individual porphyroblasts.

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