

## **Garnet effect on zircon Lu-Hf isotope systems during crustal anatexis**

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The initial Hf isotopic composition of zircon in high-grade metamorphic rocks is an excellent tracer for the determination of protolith origin. However, the Lu-Hf isotopic behaviour of anatectic melts and the crystallized zircon remains to evaluate during anatexis of continental crust. In this study, we report a detailed in-situ combined study of U-Pb, Lu-Hf and trace elements in zircons from the migmatites and related granites in eastern Himalayan syntaxis, southeastern Tibet. The results show that the anatectic zircons from the migmatites and vein granites have obviously high  $^{176}\text{Hf}/^{177}\text{Hf}$  isotopic ratios than their protolith zircons. More interestingly, the  $^{176}\text{Lu}/^{177}\text{Hf}$  isotopic ratios, the contents of high field strength elements (HFSE) such as (Nb, Ta and Hf) and rare earth elements (REE) are all significantly elevated in the anatectic zircons compared with their protolith zircons. This suggest that most garnets with high Lu/Hf ratios and other minerals (such as biotite, apatite, titanite, and so on) with moderate Lu/Hf ratios were dissolved into the anatectic melts. Thus most anatectic zircons precipitated from the anatectic melts would have elevated  $^{176}\text{Lu}/^{177}\text{Hf}$  isotopic ratios compared with the inherited zircons, and few garnet precipitated from the melt. This is confirmed by the petrological observations that garnets were widely observed in the mesosomes and some leucosomes, but were very scarce in the studied melanosomes. A few magmatic zircons in the vein granite have decreased  $^{176}\text{Lu}/^{177}\text{Hf}$  isotopic ratios compared with the inherited zircons, which may be related to a spot of co-precipitated garnet with the magmatic zircon and the preferential partition of Lu into garnet. In this study, the greatly elevated  $^{176}\text{Lu}/^{177}\text{Hf}$  isotopic compositions in the anatectic zircons from the migmatites and vein granites cannot faithfully reflect the Hf isotope compositions of their source rocks. Garnet and other minerals may play an important role in the Lu-Hf isotope compositions of anatectic zircons.