Zircon Lu-Hf and U-Pb isotopic compositions in ultrahigh-pressure eclogite from Dabie orogen, Eastern Central China

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The application of Hf isotope in zircon has been well developed to trace rock origin and the evolution of crust and mantle. However, much less attention has been paid on Hf isotopic compositions of zircons presented at ultrahigh-pressure metamorphism. Here we report the combined in situ study of intragrain Lu-Hf and U-Pb isotopic compositions accomplished with CL imaging in zircons from eclogites at Shuanghe and Xingdian from Dabie orogen to understanding the metamorphic affect of Hf isotope compositions during ultrahigh-pressure eclogite-facies metamorphism. The results show systematic change and correlations among $^{206}Pb/^{238}U$ age, initial Hf isotopic compositions, Th/U and Lu/Hf ratios in zircons from different genetic domains. The metamorphic growth domains are characterized by low Th/U(<0.1), low Lu/Hf(<0.0005) and low $^{206}Pb/^{238}U$ ages, but high $^{176}Hf/^{177}Hf$ isotopic composition relative to the igneous core and mantle of pre-metamorphic ages. The low Lu/Hf and high initial $\varepsilon_{Hf}(t)$ value of metamorphic growth domain calculated at timing of protolith fomation points that the overgrowth was associated with the addition of high $^{176}Hf/^{177}Hf$ but low $^{176}Lu/^{177}Hf$ metamorphic medium. The positive correlation between Th/U and Lu/Hf ratios were observed, implying the similar effect of metamorphism on both U-Th-Pb and Lu-Hf system. Whereas the solid metamorphic re-crystallized domains of zircon have relative high Lu/Hf, low $^{176}Hf/^{177}Hf$ ratios, distinguished from metamorphic growth, but similar to inherited protolith cores. So, growth and re-crystallization of zircon are two completely different metamorphic processes.

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