

Diffusional Pb-Loss from Zircon During Crustal UHT Metamorphism?

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The resistance of zircon to diffusional Pb-loss under crustal conditions has repeatedly been questioned. Experimental studies which tried to evaluate Pb diffusion parameters have yielded different results, but left the possibility open for diffusional Pb loss under crustal conditions (i.e. closure temperatures below 1000°C). However, laboratory experiments are limited by the short duration for which the material can be subjected to high temperatures. Natural zircon from ultra-high temperature granulites is material which has been subjected to high temperatures for several million years. Our ion-microprobe studies on UHT granulites show that there is no measurable effect of diffusional Pb loss affecting geochronological results on zircon from these rocks. Metamorphic as well as pre-metamorphic grains preserve their age information and remain concordant despite the high temperatures. None of the analyses reveal detectable Pb loss or U-Pb variations across growth zones from rim to core.

Comparisons were also made along a metamorphic field gradient between rocks which experienced about 600°C, and those which were subjected to >1000°C (pigeonite). Zircon with pre-UHT and UHT age populations was found in each location, and each population did not reveal significant differences when comparing the low-temperature and UHT rocks. We conclude that diffusional Pb-loss does not have an influence on geochronological results of non-metamict zircon under crustal conditions.