# Oxygen isotopes, REE and U-Pb behaviour during metamorphic zircon formation

MARTIN L.[1]*, DUCHÊNE S.[2], DELOULE E.[2], VANDERHAEGHE O.[3]

[1] GEMOC, Macquarie University, Sydney; lmartin@els.mq.edu.au

[2] CRPG, Vandoeuvre-les-Nancy, France; duchene@crpg.cnrs-nancy.fr, deloule@crpg.cnrs-nancy.fr

[3] UHP-G2R, Vandoeuvre-les-Nancy, France; olivier.vanderhaeghe@g2r.uhp-nancy.fr

The chemical (REE, U, Pb) and isotopic (O, Pb) compositions of metamorphic rims in zircon from a metapelite, a metabasite and an anatectic granite sampled on Naxos Island (Greece) were compared with that of their respective core in order to link their mechanism of formation and their composition. Two end-members for metamorphic zircon formation can be define depending on the equilibrium state between metamorphic zircon and the matrix.

(i) *Reworked zircon* [1] *with limited chemical or isotopic exchange between the crystal and the surrounding matrix.* Texturally, metamorphic domains are characterised by ghost zonation and/or keep the external shape of the precursor crystal. Metamorphic domains preserve partially the geochemical characteristic of the precursor zircon, which is traduced by similar REE pattern and $\delta^{18}O$ values measured in the cores and in the metamorphic zones. U-Pb ages are either discordant because of a non-achievement of the reworking process or scattered because this process is not achieved synchronously everywhere in the rock.

(ii) *Overgrowth of zircon with free elemental exchange between the crystal and the surrounding matrix.* Texturally, this type of metamorphic zircon is characterised by its own shape and zonation without magmatic relics. REE pattern and $\delta^{18}O$ values measured in the metamorphic domains are distinguishable from those measured in the cores. U-Pb ages are nearly concordant. Their possible scattering reflects the duration of the process by which these metamorphic zircon form or the fact that this process is not synchronously established everywhere in the rock.

The textural complexity of zircon crystals as well as their chemical and isotopic composition shows that intermediate cases between these extreme tendencies can occur. Following the characteristics of both end-members, only zircon overgrowths or zircon crystals are formed in equilibrium with the surrounding matrix. By contrast with reworked zircon, their chemical and isotopic composition can be used to link their growth to that of the major minerals, or as tracers to assess the geochemical characters of the metamorphic environment of the zircon.

**References**

[1] Hoskin P., Schaltegger U. (2003) *Reviews in mineralogy* **53,** 27-62.