TIMESCALES OF UHT METAMORPHIC PROCESSES: ZIRCON AND MONAZITE PETROCHRONOLOGY OF THE SOCORRO-GUAXUPÉ NAPPE, SOUTHERN BRASÍLIA OROGEN

Brenda Chung da Rocha[1], Renato Moraes[1], Andreas Möller[2], Cauê Rodrigues Cioffi[3]

[1]Instituto de Geociências, Universidade de São Paulo, Brazil (brenda.rocha@usp.br, rmoraes@usp.br); [2]Department of Geology, The University of Kansas, USA (amoller@ku.edu); [3]Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo, Brazil (caueciofi@iag.usp.br)

The timescales of orogenic processes involved during mountain building and collapse can be constrained by linking radiometric ages to REE systematics of zircon and monazite, and coexisting major metamorphic phases (e.g. garnet, pyroxene, amphibole). Zircon inheritance can persist even under UHT conditions, which makes the correct age interpretation challenging in high-grade terrains. However, zircon petrochronology using the array plot approach has the potential to evaluate zircon/garnet equilibrium and is very effective in distinguishing inherited and metamorphic zircon. Monazite electron microprobe petrochronology has the potential to link dates obtained from distinct compositional domains at high-spatial resolution to specific metamorphic reactions, providing a direct assessment of UHT metamorphic processes and events. The combination of zircon and monazite petrochronology is used in this study to refine the timescales of arc magmatism and syn-collisional UHT metamorphism in the Socorro-Guaxupé Nappe (SGN) and to constrain the P-T-t evolution. The SGN represents a deeply eroded magmatic arc that records the Ediacaran collision between the Paranapanema and the São Francisco Plates during the Southern Brasília Orogeny. Stromatic Grt-Bt metatexite, (Opx)-Grt-bearing migmatite, and mafic granulite from the sedimentary-derived Metatexite Unit, and felsic granulites (Grt-absent and less common Grt-rich varieties), mafic granulite and *in-situ* charnockite and hornblende granite leucosomes from the Basal Granulite Unit were investigated. Zircon xenocrysts (n=408) that are texturally and chemically distinct from metamorphic overgrowths, revealed a period of pre-collisional arc magmatism *ca*. 730-640 Ma. Resorbed, Y+HREE-rich monazite cores record prograde growth at *ca*. 630 Ma prior to the partial melting event, providing an upper age limit for the granulite facies metamorphism in the SGN. Apatite-related monazite records the initial stages of decompression at *ca*. 628 Ma, followed by biotite dehydration melting with generation of peritectic garnet and orthopyroxene. Syn-collisional UHT metamorphism (1030ºC, 12 kbar) at *ca*. 630-625 Ma is recorded in (Opx)-Grt-bearing migmatites from the sedimentary-derived Metatexite Unit. Garnet growth near peak conditions prior to zircon growth and small-scale equilibrium between later garnet cores and *ca*. 615 Ma zircon rims are revealed by the array plot approach in the garnet granulite. Main episodes of melt crystallization are documented by well-developed soccer ball and sector-zoned zircon overgrowths at ca. 615 and 608 Ma, which coincide with extensive Th-rich monazite growth in the (Opx)-Grt-bearing migmatites. The growth of Y+HREE-rich monazite rims at *ca*. 600 Ma documents retrograde garnet breakdown, extensive biotite growth and the final stages of melt crystallization, providing evidence for a long-lived, ca. 30 m.y. metamorphic event. Late monazite recrystallization in the presence of fluids was responsible for the formation of Th-rich, Y+HREE-poor monazite rims at *ca*. 590 Ma. Charnockite petrogenesis using whole-rock geochemistry and Sr-Nd isotopes demonstrates that in-situ orthopyroxene- and hornblende-bearing leucosomes and their granulite residues belong to the shoshonitic series. The combination of geochemical and isotopic evidence and zircon inheritance patterns argue for the involvement of lithospheric mantle sources, enriched during the subduction stage prior to the collision.

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