References

Casquet, C., Galindo, C., Tornos, F., Velasco, F., Canales, A., 2001. The Aguablanca Cu-Ni ore deposit (Extremadura, Spain), a case of synorogenic orthomagmatic mineralization: age and isotope composition of magmas (Sr, Nd) and ore (S). Ore Geology Reviews, 18, 237-250.

Tornos, F., Galindo, C., Casquet, C., Rodríguez-Pevida, L., Martínez, C., Martínez, E., Velasco, F., Iriondo, A., 2006. The Aguablanca Ni-(Cu) sulfide deposit, SW Spain: geologic and geochemical controls and the relationship with a midcrustal layered mafic complex. Mineralliun Deposita, 41, 737-769.

The migmatite – granite – granulite link in Ribeira Fold Belt (SE Brazil): product of the geodynamic (and thermochronological) evolution of the Brasiliano Orogeny

Bento dos Santos, T.[1,2], Munhá, J.[2], Tassinari, C.[3], Fonseca, P.E.[2]
1: LNEG, Portugal; 2: Universidade de Lisboa, Portugal; 3: Universidade de São Paulo, Brazil

The Ribeira Fold Belt (RFB), located in SE Brazil, is a Neoproterozoic – Ordovician mobile belt formed during the amalgamation of Western Gondwana by the collision of the São Francisco and Congo cratons. The São Fidelis – Santo Antônio de Pádua sector (central RFB) comprises migmatites (metatexites with lateral progression to diatexites) and granulites (massive and incipient-type charnockites). The latter have orthogneiss and granitoid relics and show local arrested charnockitization of the migmatites. Elemental and Sr-Nd isotopic geochemistry show that diatexites, charnockites and orthogneisses are LILE-enriched weakly peraluminous granodiorites and provide linear trends in Harker diagrams for the most immobile major, minor and trace elements (including REE), as well as in Th-Hf-La plots. These rocks also show similar REE patterns and Sr-Nd isotopic results, ranging from εNd_{575} = -5.4 to -7.3 and $^{87}Sr/^{86}Sr_{575}$ = 0.706–0.711. These results, coupled with field observations, suggest that charnockites, orthogneisses and diatexites are derived from a similar enriched crustal (meta-sedimentary) protolith (Bento dos Santos et al., 2011). Deformation events in the area include: D1 – nappe thrusts related to the earlier collision events; D2 – regional ductile thrust deformation coeval with the metamorphic peak; D3 – long-term dextral transpressive shearing and thrusting; D4 – brittle and extensional event, associated with the regional tectonic collapse (Bento dos Santos et al., 2009). Thermochronological evidence and P-T-t paths show that after the earlier D1 collision stage at 630–610 Ma, the D2 regional deformation was simultaneous with the metamorphic peak (~850 ºC, ~8.0 kbar), lower crustal melting and granulite development at ~570 Ma. High-grade metamorphism continued with decompression to P ≤ 4 kbar and cooling to ~600 ºC during long-term D3 transpressive shearing until the D4 regional tectonic collapse at ~490 Ma. The overall cooling rate was < 5 ºC/Ma, but distinct lithotypes show differential cooling and uplift: migmatites show a stable 3 ºC/Ma cooling rate, but charnockites remained at T > 650 ºC until 510–470 Ma, being then rapidly exhumed/cooled (~30 ºC/Ma) during post-orogenic D4 late granite emplacement in the area at ~490 Ma (Bento dos Santos et al., 2010). The former independent lines of evidence suggest that a genetic link exists between migmatites, granitoids and granulites and that the lithological features and evolution of the studied rocks depended on the geodynamic evolution of Pan-African orogenic events during Gondwanaland formation. This must be envisaged in terms of a long-term heating event that sustained high geothermal gradients along the main axis of central RFB and led to the formation of charnockites in a two-step process: i) generation of the hydrated igneous protoliths (diatexites and granitoids) by anatexis of metasedimentary rocks; ii) long-term high-grade metamorphism and deformation that led to orthogneiss formation and, as metamorphism and dehydration progressed, to charnockite development.

References

Bento dos Santos, T., Fonseca, P., Munhá, J., Tassinari, C., Dias Neto, C., 2009. Geodynamic evolution of the São Fidelis – Santo António de Pádua sector, Ribeira Fold Belt, SE Brazil. Comunicações Geológicas, 96, 101-122.

Bento dos Santos, T., Munhá, J., Tassinari, C., Fonseca, P., 2011. The link between partial melting, granitization and granulite development in central Ribeira Fold Belt, SE Brazil: new evidence from elemental and Sr-Nd isotopic geochemistry. Journal of South American Earth Sciences, 31, 2-3, 262-278.

Bento dos Santos, T., Munhá, J., Tassinari, C., Fonseca, P., Dias Neto, C., 2010. Thermochronology of central Ribeira Fold Belt, SE Brazil: Petrological and geochronological evidence for high-temperature maintenance during Western Gondwana amalgamation. Precambrian Research, 180, 3-4, 285-298.

New geochronological results for the Wangala Granite, Arunta Region, central Australia

Beyer, E.E.[1], Allen, C.M.[2], Armstrong, R.[2]
1: Northern Territory Geological Survey, Australia; 2: The Australian National University, Australia

The Arunta Region of central Australia is one of the most geologically complex areas on the continent. It extends over approximately 200,000 km^2 and has undergone multiple tectonothermal events in a period spanning the Palaeoproterozoic to the Palaeozoic. The region is subdivided into three provinces, each with distinct protolith ages and complex stratigraphic and tectonic evolutions. The Palaeoproterozoic Aileron Province, which comprises most of the Arunta Region, has a geological history punctuated by several episodes of dominantly felsic magmatism that are synchronous with, or postdate regional metamorphic events. Outcropping in the central Aileron Province is the Wangala Granite, a poorly understood multi-phase intrusion that is the focus of a new study into U-enriched granites of the Arunta Region. The Wangala Granite is host to the Quartz Hill U-REE occurrence, a prospect that is attracting interest because of increasing global demand and prices for these commodities. New laser-ablation-ICPMS U-Pb zircon data for the granite and for the associated biotite-apatite schist that hosts the mineralisation are presented here and enable a better understanding of the relationship between the two rock types. The Wangala Granite is a peraluminous composite batholith, comprising numerous phases of variably fractionated, crustally contaminated LREE-enriched granite-granodiorite. The dominant phase is a coarsely porphyritic biotite-muscovite monzogranite, containing abundant zircon with complexly-zoned cores mantled by thick (>100 µm) U-rich overgrowths. Core analyses have yielded an age of 1782 ± 9 Ma; this is interpreted as the magmatic crystallisation age and suggests emplacement during the 1780–1770 Ma Yambah Event. This event is characterised by abundant felsic and intermediate magmatism and is widely recognised in the Aileron Province. Rims give a poorly constrained age of 1565 ± 31 Ma, broadly consistent with new zircon growth during the 1590–1560 Ma Chewings Orogeny, a tectonothermal event that is restricted to the central Aileron Province. The relatively undeformed nature of the granite implies that this overprinting event was thermal rather than deformational in character. Unusual U, P, Y and REE enrichment, seen in some zircon rims, is interpreted to have resulted from an episode of high-T fluid flow at this time.