METABASITES WITH ECLOGITE FACIES RELICS IN THE VARISCAN BELT OF NORTHERN SARDINIA, ITALY: REVIEW AND DISCUSSION

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Metabasites with eclogite facies relics occur as decametric to hectometric boudins or lenses in the Variscan belt of northern Sardinia. They are enclosed as allochthonous bodies in the Variscan migmatites (NE Sardinia) or embedded in the medium-grade metapelitic complex of Anglona and Asinara regions (NW Sardinia). Based on mineral assemblage and microstructure four main stages of recrystallization have been distinguished:
Stage I the eclogite stage is documented by the occurrence of omphacite relics, garnet porphyroblasts, quartz, zoisite, rutile and barroisite. The eclogite assemblages of Golfo Aranci metabasites also include kyanite, high-Mg garnet and pargasite. Stage II - The granulite stage is documented by the destabilisation of omphacite and by the growth of clinopyroxene + plagioclase symplectite, sometimes with orthopyroxene. In the retrogressed eclogites from Golfo Aranci the symplectitic rims consist of sapphirine + anorthite + corundum + spinel or spinel + anorthite + corundum in contact with relict kyanite. Stage III - The amphibolitisation of the granulite assemblage led to the formation of amphibole + plagioclase kelyphite between garnet porphyroblasts and pyroxene-plagioclase symplectites and to the growth of orthoamphibole on orthopyroxene. Tschermakite to Mg-hornblende, plagioclase, cummingtonite, ilmenite, titanite and biotite are coexisting phases. Stage IV - The later greenschist to subgreenschist stage is characterised by actinolite, chlorite, epidote s.s., titanite, sericite and prehnite. All these stages are not always recognizable in the various outcrops, owing to re-equilibration at lower temperatures and/or pressures. Mineral relics of a pre-eclogitic prograde amphibolite stage have also been documented in the metabasite from Golfo Aranci. The granulite stage has not been recognized in the metabasite from the medium-grade complex of Anglona. Here, the eclogite stage was directly overprinted by the amphibolite one. The following P-T ranges have been estimated for the different stages. Eclogite stage: 460 – 760 °C; minimum pressure: 1.3 GPa at 700 °C. Granulite stage: 650 - 899 °C; 0.8 - 1.2 GPa. Amphibolite stage: 550 – 740 °C; 0.3 - 0.7 GPa. Greenschist stage: 300 – 400 °C; 0.2 - 0.3 GPa. Radiometric data on zircons (SHRIMP, PALMERI et al., 2004 – a; LA-ICPMS – b; Conventional – c) from eclogites from different sites indicate: protolith ages of 453 ± 14 Ma (a), 460 ± 5 Ma (b) and 457 ± 2 Ma (c); presumed age of eclogite facies metamorphism or the result of a Pb-loss during the Variscan metamorphism around 400 ± 10 Ma (a) and 403 ± 4 Ma (c); ages of 352 ± 3 Ma and 327 ± 7 Ma has been attributed to the main Variscan retrograde events.

References

PALMERI, R., FANNING, M., FRANCESCHELLI, M., MEMMI, I., & RICCI, C.A. (2004): N. Jb. Miner. Mh., 6, 275-288.