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Fluid and cooling-driven reaction exsolution in garnet porphyroblasts: near-peak history of UHT granulites, EGB, India
Fluid and cooling-driven reaction exsolution in garnet porphyroblasts: near-peak history of UHT granulites, EGB, India

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Intergrowth textures in porphyroblastic assemblages of granulites are extremely important to decipher the near-peak evolutionary history of deep continental crust undergoing several pulses of orogenic cycles. Eastern Ghats granulite belt of India evolved through Proterozoic orogenic events has occurrences of aluminous granulites and associated quartzofeldspathic gneisses where garnet porphyroblasts contain nanometer- to micrometer-thick ilmenite needles oriented crystallographically. Such garnet porphyroblasts are presumably a product of dehydration melting reaction(s) of Ti-rich phlogopite during the pre-peak metamorphic stage leading to the UHT peak condition. The high oxygen fugacity condition during this stage promoted the enrichment of possible Ti-bearing andradite component in garnet porphyroblasts in appropriate bulk chemistry. In the subsequent post-peak cooling-dominated history with lowered oxygen fugacity, Ti-bearing components of garnet porphyroblasts decomposed to rhombohedral oxide solid solution (ilmenite-hematite). Transmission electron microscopic study of the garnet porphyroblasts and needle-shaped monomineralic ilmenite solid solution indicates that though there is an overall parallelism of [011]$*$ of host garnet and [011]$*$ of ilmenite, structural coherence between the two phases is progressively lost during growth from thin to thick needles. We argue that cooling from high-temperature peak metamorphic condition promoted growth of ilmenite solid solution through reaction-exsolution process within garnet porphyroblasts. Integrated temperature and fO2 information during deep crustal evolution can thus be retrieved from the detailed petrographic, SEM. EPMA and TEM studies of high-grade granulites.

キーワード: Oriented ilmenite needles, Garnet porphyroblasts, UHT granulites, Reaction-exsolution, EGB, India
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