Mineral geochemistry of garnet, apatite and rutile in a leucosome intergrowth with UHP eclogite from the North Qaidam of NW China

DANLING CHEN, YUNFEI REN AND LIANG LIU

The Key Laboratory of Continental Dynamics, Department of Geology, Northwest University, Xi'an, 710069, China

The leucosome is interbeded with an eclogite enclosed in granitic gneiss in the Yuka UHP terrane in the North Qaidam. It consists of albite, garnet, amphibole, phengite and minor apatite, rutile and quartz. Garnets show diablastic texture with lots of small irregular quartz inclusions. Apatites occur as euhedral prism inclosed in coarse grained albite. Rutiles have two occurrences, one is of large size with rounded shape and the other is euhedral prismatic crystal. Zircon U-Pb dating and microinclusion investigation indicated that the leucosome underwent eclogite-facies metamorphism with coexisting coesite-bearing eclogite at the same time, however, no HP/ UHP indicators were found in existing mineral assemblage. To trace its genesis and metamorphism, mineral geochemistry analyses were performed. Garnets show mutiple-stage growth zoning pattern of an increase in pyrope and decrease in grossular and spessartite components at the rim. All analyzed garnets display MREE enriched REE patterns with positive Eu anomaly, similar to that of garnet outer rims in adjacent UHP eclogite, which formed at the tempereture peak stage during initial exhumation. Phengite has Si value of about 3.4 p.f.u. Apatites are fluorine-type and contain high content of Sr and LREE and display LREE enrichment ($La_N/Sm_N>1$) and HREE depletion REE patterns without any Eu anomaly, indicating the fluid/melt-assosiated HP metamorphic origion. *in situ* apatite Sr isotope analyses obtained ($^{87}Sr/^{86}Sr)_0$ vary slightly between 0.709 and 0.710, similar to the hosted leucosome of 0.717 to 0.734 and adjacent eclogite of 0.713 to 0.715, distinct from granitic gneisses of 0.810 to 0.873. Coarse grained rutiles have higher Nb (4577~7123 ppm), lower Ta (118~290 ppm) content and suprachondritic Nb/Ta ratios (19.55~38.59) compared to the euhedral prism ones (4716~5985 and 247~363 ppm and 13.9~20.8, respectively), both distinct from those in the adjacent eclogite (844~1249 and 46.12~67.93 ppm and 15.8~19.7, respectively) and in micro-phengite-quartz vein in the eclogite (923~1650 and 74.43~376.77 ppm and 4.4~13.7, respectively). All of these suggest that 1) the leucosome has once underwent at least HP metamorphism; 2) Apatite and euhedral rutile formed during the initial exhumation associated with fluid/ melt activity; 3) The content of Nb and Ta in rutile were mainly controled by their protolith composition.