GROWTH RATE OF ACCESSORY AND ROCK-FORMING MINERALS IN UHPM ROCKS FROM THE KOKCHETAV MASSIF (NORTHERN KAZAKHSTAN)

KORSAKOV, A.V., KOZMENKO, O.A. & OVCHINNIKOV, Y.I.

Insititute of mineralogy and petrography SB RAS, Koptyug Pr. 3, 630090, Novosibirsk, Russia
e-mail: korsakov@uiggm.nsc.ru

A new approach for estimating the growth rate of coexisting minerals is developed with data from the UHPM Kokchetav massif, where garnet and zircon are amongst the most common coexisting minerals. Both minerals grew within a wide range of P-T conditions in UHPM rocks (SOBOLEV et al., 1994; SHATSKY et al., 1995; KORSAKOV et al., 1998). Garnet porphyroblasts from the zoisite gneisses are characterized by a homogeneous core and a sharply marked rim zone, with CaO abruptly decreasing from 16 wt% core to 12 wt% rim. In addition to diamond/graphite and coesite/quartz also garnet commonly occurs as inclusions in zircon. Frequently such garnet inclusions occur in different growth zones of one single zircon crystal. In some cases garnet inclusions display marked compositional differences: garnet inclusions, close to the zircon core, are as Ca-rich as the core zones of garnet porphyro-blasts and garnets included in the rim of the zircon have similar composition as rim zones of the garnet porphyroblasts.

Since zircon is known as the best refractory "container" (SOBOLEV et al., 1994), the composition of its inclusions remains undisturbed from the moment of their entrapment. The garnet inclusions in zircon can be considered as isolated fragments from succeeding growth zones (core and rim) of garnet porphyroblasts. The distance between both garnet inclusions within the single zircon grain is 30 μm, while in porphyroblast the distance between similar composition points varies from 60 to 100 μm. The relative growth rates for zircon (G_{Zm}) and garnet (G_{Grt}) can be estimated as high as $G_{Zm} / G_{Grt} = 0.3 - 0.5$. Absolute values of growth rates can be obtained by SHRIMP dating of zircons including these garnets. Unfortunately Precambrian rocks from the Kokchetav massif are not suitable for this purpose, because the age intervals for the different zircon growth domains are within the analytical error of SHRIMP analyses (HERMANN et al., 2001). However for "young" UHPM complexes this approach could be a powerful tool for the estimation of mineral growth rates.

This study was supported by Russian Foundation for Basic Research (No.04-05-64360), MK-1041.2004.5 and Russian Science Support Foundation.

References

SOBOLEV, N.V., SHATSKY, V.S., VAVILOV, M.A. & GORYAINOV, S.V (1994): Dokl. Akad. Nauk SSSR, 334, 488-492.

SHATSKY, V.S., SOBOLEV, N.V & VAVILOV, M.A. (1995): Diamond-bearing metamorphic rocks from Kokchetav massif (Northern Kazakhstan). - In: Ultrahigh Pressure Metamorphism: Cambridge Univ. Press, p. 427-455.

KORSAKOV A.V., SHATSKY, V.S. & SOBOLEV, N.V (1998): Dokl. Akad. Nauk, 360, 77-81.

HERMANN J., RUBATTO, D., KORSAKOV A. & SHATSKY, V.S. (2001): Contrib. Min. Petrol., 141, 66-82.