Geophysical Research Abstracts,
Vol. 10, EGU2008-A-05029, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-05029
EGU General Assembly 2008

^{40}Ar/^{39}Ar dating of K-tourmaline from the Kokchetav UHP massif

A.V. Korsakov (1,*), A.V. Travin (1), D.S. Yudin (1), H.R. Marschall (2) and O.A. Kozmenko (1)

(1) Institute of Geology and Mineralogy, Koptyuga prospect 3, 630090 Novosibirsk, Russia, (2) Department of Earth Sciences, University of Bristol, UK (korsakov@uiggm.nsc.ru / Fax: +7 383- 3332792)

Recently, high-K tourmaline (Tur; 2.76 wt% K_2O) coexisting with microdiamond was discovered in quartzofeldspathic rocks from Kumdy-kol in the Kokchetav UHP massif, northern Kazakhstan [1]. The sample investigated in our study from the same locality is dominated by quartz, Kfeldspar and Tur ($\sim$10 vol %), with minor titanite, phengite, chlorite, zircon, biotite, apatite, graphite and sulphide. Mineral assemblages preserved as inclusions in zircon consist of garnet, phengite and coesite. Despite an extensive search, no Tur inclusion was identified in ultrahigh-pressure (UHP) minerals (e.g. zircon, garnet, K_2O-bearing clinopyroxene). Furthermore, numerous quartz grains, but no coesite or microdiamond was identified as inclusions in Tur in our sample. We therefore interpret K-Tur in our sample to have formed under retrograde Pconditions in the quartz stability field. ^{40}Ar/^{39}Ar dating of tourmaline (492.5$\pm$4.8 Ma) and phengite (491.5$\pm$4.9 Ma) further supports the retrograde origin of tourmaline. For the Kumdy-Kol area there exists ^{40}Ar/^{39}Ar data on biotite and muscovite, which formed during retrograde amphibolite-facies metamorphism [2]. [2] describe results from ^{40}Ar/^{39}Ar stepwise heating of muscovite and biotite that produced well-defined plateaux, each with an age of 517$\pm$5 Ma. These ages have been interpreted to represent cooling to 300–400˚C post-dating the amphibolite-facies overprint of the UHP rocks, therefore ages of tourmaline and phengite are defined another metamorphic event, which occurs at middle crustal conditions.

The chemical compositions of Tur, however, is similar to the Tur for which [1] re-

ported microdiamond inclusions. Tur in the Kumdy-kol sample is a K-analogue of dravite (0.35 Na pfu; Mg#: ∼87) with remarkable contents of tetrahedral B (∼3.3 B pfu) and Ca (∼0.3 pfu). K_2O contents are as high as 1.57 wt % (∼0.3 K pfu). The Tur displays a very low X-site vacancy (<0.05) and high OH (∼3.4 pfu) and F (0.27 pfu) contents. At their rims and along cracks, all Tur grains show a strong decrease in K content to less than 0.05 wt%, accompanied by an increase in Na (∼0.5 pfu), in X-site vacancies (0.2 to 0.3 pfu), and a slight increase in Al. All other elements are unzoned. Tur cores are homogeneous in B isotopes (δ11B = +10.6 ‰; analysed by SIMS in Heidelberg, Germany). Towards the rims, δ11B values decrease to +5.5 ‰. These values are significantly higher than values reported previously for Tur from metasedimentary rocks or any (U)H*P*rocks (typically -10 ‰). Heavy-B Tur (δ11B > +5 ‰) has been described only from metapelite-marble contacts [3,4], from partially melted granulites [3], from evaporites, and from hydrous reaction zones around H*P*metamorphic blocks formed by an influx of external hydrous fluids [5]. Hence, the high modal proportion of heavy-B Tur and Ar-Ar daiting of tourmaline and phengite in the Kokchetav samples are best explained by a post-peak pressure influx of B-rich fluids or melts generated in biogenic-chemical sediments, i.e. carbonates or meta-evaporites.

This work was supported by the Russian Foundation for Basic Research (07-05-00308-a), MK-259.2008.5 and Russian Science Support Foundation.

[1] Shimizu & Ogasawara (2005) *Mitt Öster Min Ges* **150**:141 [2] Shatsky et al. (1999) *Contrib. Miner. Petrol.*, **137**, 185–205 [3] Palmer & Slack (1989) *Contrib Min Petrol* **103**: 434-451 [4] Swihart & Moore (1989) [5] Marschall *et al*. (2006) *JPet* **47**: 1915-1942