Geophysical Research Abstracts, Vol. 9, 09146, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-09146

S and As in accessory monazite: a role of "clinoanhydrite" and gasparite substitution

P. Uher (1), M. Ondrejka (1), I. Broska (2)

(1) Dept. of Mineral Deposits, Dept. of Mineralogy and Petrology, Comenius University, Mlynská dolina G, 842 15 Bratislava, Slovakia, (2) Geological Institute, Slovak Academy of Sciences, Dúbravská cesta 9, 840 05 Bratislava, Slovakia (puher@fns.uniba.sk)

Sulphur and arsenic are commonly incorporated into phosphate $(PO_4)^{3-}$ minerals as anionic sulphate $(SO_4)^{2-}$ and/or arsenate $(AsO_4)^{3-}$ isomorphous substituents (e.g. apatite, crandallite, arthinite groups). Contents of S and As in accessory monazite-(Ce) from granitic rocks and rhyolites are usually negligible. Therefore, these elements were not systematically analysed in monazite. However, our investigation on magmatic monazite from some Hercynian granites and rhyolites from Western Carpathians (Slovakia) documented sytematic presence of As and locally also increased contents of S.

The S is incorporated through "clinoanhydrite" substitution $CaSREE_{-1}P_{-1}$ or $Ca^{2+} + (SO_4)^{2-} = REE^{3+} + (PO_4)^{3-}$. The S in the Tisovec-Rejkovo A-type rhyolite reached up to 4.8 wt.% SO_3, 0.14 S apfu, corresponding with Ca enrichment (up to 0.1 Ca apfu) but not with analogous Th-rich compositions as expected for brabantite/cheralite substitution, $CaThREE_{-2}$ (Ondrejka et al., in press). The S contents in monazite-(Ce) from the S- and I-type granites are generally lower, usually below 0.2 wt.% SO_3, max. 1.6 wt.% SO_3, 0.05 apfu (Tribeč I-type granodiorite). The presence of hypothetical "clinoanhydrite" $CaSO_4$ molecule in monazite is supported by existence of monazite-type structure of $CaSO_4$ at high pressure and temperature (experiments up to 120 kbar and ca. 1000 ˚C, Crichton et al., 2005). However, at natural low-pressure conditions, analogous to the Tisovec-Rejkovo rhyolite formation, probably only limited "clinoanhydrite" substitution really played a role.

Presence of As in the studied magmatic rocks is more systematic, almost all studied granites contain 0.1-0.2 wt.% As_2O_5 (0.002 to 0.004 As apfu). On the contrary,

Tisovec-Rejkovo rhyolite contains nearly complete monazite-gasparite $REEPO_4$-$REEAsO_4$ solid solution; As/(As+P) = 0.00 to 0.73. The “clinoanhydrite“ and gasparite substitutions in granitic rocks seems to be a primary magmatic feature, whereas large S and As incorporation in the investigated rhyolite indicates a sub-solidus nature, probably due to post-magmatic (hydrothermal?) overprint of the primary volcanic rock.

References

Crichton W.A., Parise J.B., Antao S.M. & Grzechnik A. (2005): Evidence for monazite-, barite-, and $AgMnO_4$ (distorted barite)-type structures of $CaSO_4$ at high pressure and temperature. Am. Mineral. 90, 22-27.

Ondrejka M., Uher P., Pršek J. & Ozdín D. (in press): Arsenian monazite-(Ce) and xenotime-(Y), REE arsenates and carbonates from the Tisovec-Rejkovo rhyolite, Western Carpathians, Slovakia: Composition and substitution in the $(REE,Y)XO_4$ system (X=P,As,Si,Nb,S). Lithos, in press.