

Fluid-induced breakdown of monazite-(Ce) and xenotime-(Y) and formation of fluorapatite-LREE-epidote and fluorapatite-allanite-(Y) coronas in the grusified Izera metagranites of the northern Bohemian Massif

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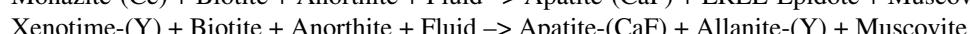
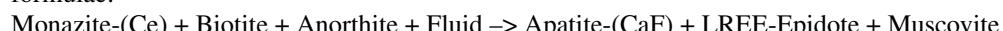
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Izera-Kowary Unit is located at the northern part of the Karkonosze-Izera massif (SW Poland). During investigation of partly grusified coarse-grained Izera granites (about 500Ma) collected in the Siedlęcin village, altered monazite-(Ce) and xenotime-(Y) were found.

Primary, igneous phosphates were probably altered during Variscan amphibolite facies metamorphic overprint. Monazite-(Ce) was partly substituted by apatite and LREE-bearing epidote coronas. Thorium, equally distributed in the primary monazite-(Ce) accumulates in coronas, forming cheralite halos. Alteration of primary xenotime-(Y) is similar, but instead of LREE-bearing epidote, allanite-(Y) is formed. External coronae composed of epidote, described commonly in other studies, is rather scarce.

The chondrite-normalized REE patterns for the primary (monazite-(Ce) and xenotime-(Y)) and secondary minerals (epidote, allanite-(Y), apatite-(CaF)) are similar. In apatite-(CaF), in which the amount of REE and Y is below 0.05 wt.%, REE patterns reflect the patterns observed in primary phosphates less accurately. In monazite grain, which contains xenotime inclusion, Y and HREE are irregularly distributed inside the whole monazite grain, and create brighter and darker areas in BSE image, what can indicate, that altered xenotime-(Y) were incorporated during alteration into surrounding monazite-(Ce).

Alteration of monazite-(Ce) and xenotime-(Y), in the presence of water-rich fluids, may be described by following formulae:



Such kind of reactions are usually connected with the activity of Ca-, F-, Al- and Si-rich fluids.

Presence of epidote (not only the REE-bearing epidote and allanite-(Y) described here) and low-Ca plagioclase (albite-oligoclase) indicate, that alteration of Izera granites could have been altered under the albite-epidote-amphibolite facies conditions, although granite samples do not show intense metamorphic deformation.