



Dissolution-Reprecipitation of Xenotime and Simultaneous Growth of Thorite-Coffinite.

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Textures, characteristic of metasomatic alteration, in xenotime from pegmatites in the Hydra anorthosite at Flekkefjord, southwest Norway are presented. The xenotime is found in undeformed sheet-like pegmatites that have straight sharp contacts with the host rock, are between 1 and 15 m thick, and dip towards the north. The pegmatites may be characterised by the mineral assemblage xenotime + monazite + quartz + K-feldspar + plagioclase + muscovite + biotite + allanite + magnetite. The anorthosite is undeformed and consists of 1-3 cm plagioclase crystals (An_{40-55}) and up to 10 Vol. % orthopyroxene. However, it is altered in a 50 cm thick zone adjacent to the upper contact of each pegmatite. In the alteration zone a reduction in grain size is documented, the growth of chlorite has given the rock a dark green colour and pyrite growth is common. Xenotime occurs as discrete crystals that are 1-2 cm in size, medium to light-brown in colour, with roughened faces. The outer crust of many crystals shows evidence of porosity development. Unaltered areas of the xenotime are enriched in Dy_2O_3 (~4.0 wt.%), Er_2O_3 (~2.5 wt.%) and Yb_2O_3 (~3.5 wt.%), and also contain appreciable amounts of SiO_2 , ThO_2 and U_2O_3 (1-2 wt.% each). Relative to the original xenotime, metasomatised areas are relatively poorer in Si, Th and U and contain numerous small (10-20 μm) inclusions of thorite-coffinite. In contrast, no evidence of monazite alteration is observed. Metasomatic alteration of apatite at Ødegårdens Verk and the Gloserheia granite pegmatite resulted in the growth of monazite. That reaction was promoted by fluid infiltration along c-axis parallel microtubes. At Hydra it is proposed that a similar process occurred and hydrothermal fluids reacted with xenotime leaching Th, U, P and Si, which contributed to the growth of thorite-coffinite. The textures imply that this reaction occurred *in situ* via dissolution-reprecipitation of xenotime and concomitant growth of thorite-coffinite. The absence of analogous tex-

tures in monazite from the Hydra pegmatites, which contains appreciable SiO_2 (~ 3.25 wt.%), ThO_2 (~ 12.5 wt.%) and U_2O_3 (~ 0.4 wt.%), suggests that the crystallographic properties of the phosphates may also be important. The tetragonal lattice of xenotime could have provided a template for the growth of tetragonal thorite-coffinite; monazite is monoclinic and a similar reaction was thus crystallographically unfavourable.