

## **Metasomatic thorite and uraninite inclusions in xenotime and monazite from granitic pegmatites, Hydra anorthosite massif, southwestern Norway: Mechanics and fluid chemistry**

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### **ABSTRACT**

Thorite and uraninite inclusions are documented in metasomatized regions in three xenotime crystals and one monazite crystal collected from three granitic pegmatites hosted within an anorthosite intrusion located on the island of Hydra, southwestern Norway. Formation of these inclusions is demonstrated to be the result of dissolution-reprecipitation processes that occurred in an effectively closed chemical system. The reaction was initiated by interaction between the early crystallizing orthophosphate minerals and the evolving pegmatite fluid. This fluid was dominated by H<sub>2</sub>O, but also contained F and minor amounts of Cl, and significant quantities of dissolved Na<sup>+</sup> and K<sup>+</sup>. This is an example of auto-metasomatism and highlights a natural case where Th-U-Si-enriched orthophosphate minerals have been partially altered such that the Th, U, and Si have been converted to secondary inclusions within the now Th-U-Si-depleted orthophosphate via reaction with fluids rich in alkali elements.

**Keywords:** Monazite, xenotime, thorite, uraninite, dissolution-reprecipitation, pegmatite, alkali-rich fluids