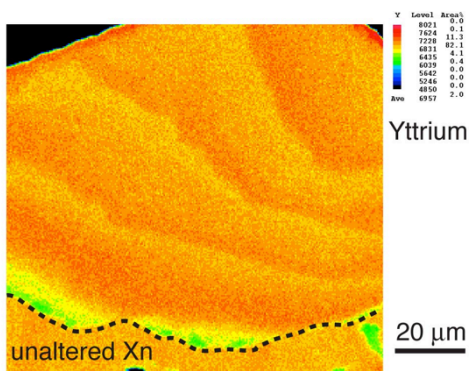


## Experimental incorporation of U into xenotime at 900 °C, 500-1000 MPa utilizing alkali-bearing fluids

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In this study, specific areas of a natural Th-absent, low U, xenotime  $[(Y+HREE)PO_4]$  of uniform composition, are experimentally enriched in U + Si utilizing a NaF + H<sub>2</sub>O fluid plus UO<sub>2</sub> and SiO<sub>2</sub> under both reducing (graphite-CO/CO<sub>2</sub> buffer) and oxidizing (Mt-Hm buffer) conditions. Charge and fluid were sealed in 2 cm long, 3 mm diameter Au and Pt capsules. In the reduced experiment the Au capsule was placed in the piston-cylinder apparatus (CaF<sub>2</sub> assembly; graphite oven; 1000 MPa; 900 °C; 8 days). In the oxidized experiment (500 MPa; 900 °C; 4 days) the Pt capsule was packed with Hm + H<sub>2</sub>O into a 4 cm long, 5 mm diameter Pt capsule, which was placed in the gas apparatus. BSE imaging indicates that the altered areas occur as a series of curvilinear intergrowths with sharp compositional boundaries that extend from the edge of the xenotime grain into the interior. EPMA indicates that the altered areas from both experiments are enriched in U + Si via the coupled substitution  $U^{4+} + Si^{4+} = (Y+HREE)^{3+} + P^{5+}$ . WDS element distribution maps indicate that U + Si are concentrated close to the compositional interface between the altered and unaltered xenotime with corresponding depletion in Y+HREE. Across the altered region Y occurs as a series of concentric waves of relative enrichment and depletion with contrasting depletion and enrichment in HREE (see Y element map below).



Element movement is interpreted as a consequence of fluid-mediated coupled dissolution-precipitation in some sort of a chromatographic column effect across the altered area. Fluid-aided incorporation of U into xenotime has implications with respect to its utilization as a metamorphic geochronometer.