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REE mobility during the alteration of Carbonatite and their economic potential.

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The supply risk of Rare Earth Elements is an unpredictable economic factor for the future application and development of modern technology for the EU. Therefore a better understanding of REE mobilisation during hydrothermal alteration of Carbonatites is essential for a safer supply of REE in general.
The hydrothermal alteration of Carbonatite within the Fen Complex (Norway) forms a fine grained red hematized rock type, called Rødbergite, which is partially enriched in REE. The variation of REE within the Rødbergite is poorly understood and problematic for any future REE exploitation from Rødbergite. A genetic model of the formation of Rødbergite will provide more information about the economic potential of Rødbergite.
The gradual transformation of carbonatite to Rødbergite is not easily observable due to sparse outcrop in the Fen Complex. A fresh road cut near the Bjørndallen farm (Fen Complex) provides a unique insight to the progressive hydrothermal alteration from carbonatite to Rødbergite and is therefore crucial for a genetic model of the formation of Rødbergite. 14 Samples were taken along the profile. The mineralogical, geochemical and textural characterization of the samples using the SEM as well as major-, trace- and isotopic elemental data revealed the breakdown of the primary minerals due to the infiltration of an oxidizing fluid along grain boundaries.
The primary REE-minerals in unaltered Carbonatite are REE fluorocarbonates. With the increasing alteration to Rødbergite REE fluorocarbonates are progressively replaced by hematite. In contrast, monazite – a REE-phosphate – is the dominant REE mineral species in the Rødbergite. A transitional Rødbergite sample shows apatite aggregates with a strong preferential concentration of monazite along the rim of the apatite aggregates. This observation provides strong evidence for the solution of REE in the primary rock (carbonatite) by fluids and later precipitation of REE along phosphate bearing minerals (e.g. apatite) in order to form monazite. The latest results of the mineralogical investigation on the structural control of the REE mineralization, different generations of REE minerals and the potential concentration of REE in distinct zones in the profile, will also be presented.
Future work will contribute to a better understanding of the REE mineralization process and therefore help to identify economically promising areas for a potential REE exploitation within the Fen Complex.