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The impact of Se and Np on Calcite growth

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Calcite is an ubiquitous mineral in numerous natural settings as well as in potential host rocks for high level nuclear waste repositories. Its retention capacity for Se and Np is critical for the safety assessment of nuclear waste repositories.

If the waste containers come into contact with groundwater, tank failure due to corrosion will eventually lead to the release of radionuclides from the waste. In this case, the retention capacity of the surrounding host rock governs the mobility of radionuclides. The understanding of said retention processes and underlying KD values can be applied in preliminary saftey assessments of potential disposal sites. In natural geological systems, Calcite may be subjected to dynamic dissolution and re-precipitation processes (recrystallization). This study addresses the incorporation of Se and Np into Calcite and the complex interplay between ion uptake and recrystallization rates. The recrystallization from aragonite to calcite allows us to investigate the growth of calcite under relatively constant, low supersaturations. Long-term recrystallization experiments have been performed both under the presence of $Np(V)O_2^+$ and $Se(IV)O_3^{2-}$. Both ions were observed to inhibit the recrystallization process in seperate long-term batch experiments. Under the presence of Se, growth on certain crystal faces is inhibited more strongly, leading to changes in the crystal habit, which have been observed through SEM and XRD. AFM studies have been conducted to get a better understanding on the mechanisms involved.

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