

The mechanisms of Sr ion exchange into partially niobium substituted sitinakite

S.J. KRAMER* AND A.J. CELESTIAN

Western Kentucky University, Bowling Green, KY 42101, USA (*correspondence: samantha.kramer@wku.edu, aaron.celestian@wku.edu)

A 25% niobium substituted sitinakite was exchanged with strontium as time resolved X-ray diffraction data was collected. The structural modelling of this data by Rietveld methods [1] has lead to the determination of the atomic positions of the ions and unit cell parameters as strontium occupancy increases.

The starting material of the exchange experiment is the protonated phase, $\text{H}_2\text{Nb}_{0.25}\text{Ti}_{0.75}\text{SiO}_7 \cdot 1.5\text{H}_2\text{O}$, with space group $\text{P4}_2/\text{mcm}$ [2-3]. Once strontium enters the unit cell, extra-framework H_2O molecules shift to provide the necessary hydration coordination. These new positions of H_2O result in a lowering of symmetry to the P-42m space group, and it is thought that the new hydrogen bonding network serves to enhance strontium ion diffusion into the channels of sitinakite. There is an expansion along the ab plane and contraction along c resulting in an overall unit cell volume expansion through the first few hours of exchange followed by a volume contraction as strontium is sequestered into the framework.

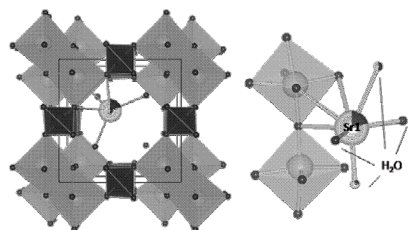


Figure 1: Strontium exchanged sitinakite, displayed along the c axis and the bonding arrangement of strontium with three framework oxygens and four H_2O molecules.

[1] Rietveld (1969) *J of App. Cryst.* **2**, 65–71 [2] Celestian *et al.* (2007) *Inorg. Chem.* **46**, 1081–1089 [3] Tripathi *et al.* (2005) *J of Solid State Chem.* **178**, 253–261

Stimulated Cd uptake and accumulation in the plant *Arabidopsis halleri* by dissolution of Cd-bearing Fe(III) (hydr)oxides by Fe(III)-reducing bacteria

U. KRÄMER^{1*}, E.M. MUEHE² AND A. KAPPLER²

¹Plant Physiology, University of Bochum

(*correspondence: Ute.Kraemer@ruhr-uni-bochum.de)

²Geomicrobiology, University of Tuebingen

Soils worldwide have been contaminated with industrial waste metals, such as cadmium, which may subsequently enter the food chain through plants. These metal contaminants can have dramatic effects on human and environmental health. Therefore, there is a need for the development of new techniques to efficiently remediate contaminated soils. In the present study, we combine phytoremediation and microbial mineral transformation to determine whether a more time- and cost-efficient removal of Cd from contaminated soils can be achieved. Anaerobic Fe (III)-reducing and microaerophilic Fe (II)-oxidizing bacteria were enriched and isolated from Cd-contaminated sites bearing natural populations of the metallophyte Cd hyperaccumulator plant *Arabidopsis halleri*. We are currently determining geochemical and microbial parameters in plant-microbe-soil microcosms to trace the microbial (im-)mobilization of Cd from Cd-bearing Fe (III) minerals by Fe (III)-reducing bacteria and Cd uptake by the plant *Arabidopsis halleri*. In particular, we determine whether Cd is made phytoavailable to the plant by the stimulation of naturally occurring Fe (III)-reducing bacteria which potentially release Cd from Fe (III) (hydr)oxides through reductive dissolution. The aqueous Cd can be taken up by the plant *A. halleri* and accumulates in the above ground tissue. By harvesting the plant, efficient removal of Cd from contaminated soils may be achieved.