

## Structurally stabilization of Cd(II) and Cr(III) during Fe(II)-induced phase transformation of Al-ferrihydrite

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Al-substituted iron oxides structurally is a general mineralogical phenomena in soils, and they play important roles in biogeochemical process of soil elements. The present study focused on the structurally stabilization of two metal cations with different valence, i.e. Cd(II) and Cr(III), during the Fe(II)-induced phase transformation of Al-substituted ferrihydrite. The binding stabilities of these two cations affected the transformation pathways of Al-ferrihydrite through affecting the intensity of bound-Fe(II) on the surface Al-ferrihydrite. During the Fe(II)-induced Al-ferrihydrite transformation, less divalent cation of Cd(II) were stabilized in Al-ferrihydrite compared with the trivalent cation of Cr(III), much of which were adsorbed on and structurally stabilized in the transformed iron oxides. Al-ferrihydrite with higher ratio of substituted Al stabilized more cations. The same trivalence and the more similar ionic radii of Cr(III) with that of Al and Fe in the Al-ferrihydrite lead to higher incorporation of Cr(III) in formed secondary iron minerals from the Fe(II)-induced transformation of Al-ferrihydrite, compared with that of Cd(II). Accompanying with the structurally incorporation of the metals, Al and Fe were released during Fe(II)-induced reactions, and the concentrations increased quickly firstly and then kept constant over the reaction time. The Cr and Cd *K*-edge EXAFS characterization of the formed secondary minerals further confirmed the structurally incorporation of these two metals during Fe(II)-induced phase transformation of Al-ferrihydrite, in which the concentration of incorporated Cr was much higher than Cd. However, the substituted sites (Al- or Fe- ?) of the cations in transformed Al-ferrihydrite are still needed to be further explored.