On the akaganeite crystal structure, phase transformations and possible role in post-excavational corrosion of iron artefacts

The crystal structure of akaganeite and the akaganeite to hematite transition has been studied by means of conventional and synchrotron X-ray and neutron powder diffraction. The chemical formula of akaganeite can be written as FeO0.833(OH)(1.167)Cl-0.167. The crystal structure does not contain free water. Heating below 200 degreesC will not alter the akaganeite structure. Initial water loss can be attributed to a large amount of adsorbed water due to a very small particle size; 0.15 mum by 0.03 mum. Chloride is released from the structure only in connection with the transformation to hematite. Due to its stability, the presence of akaganeite does not in itself posses a threat to iron artifacts, but it is rather a symptom of the presence of high concentrations of chloride in an acidic environment.