Substitution of Multimetals in goethite

N.KAUR[1], B. SINGH[1] AND M. GRÄFE[1]

[1] Faculty of Agriculture, Food & Natural Resources, The Unviersity of Sydney, NSW 2006, Australia.
nkau9577@usyd.edu.au, b.singh@usyd.edu.au, m.grafe@usyd.edu.au,.

Introduction

Goethite (α-FeOOH) is one of the most stable iron oxide minerals that forms under diverse environmental conditions and in the presence of various heavy and trace metals. Substitution of single metal cations, especially Al^{3+}, in the structure of goethite has been studied widely. Studies relating the substitution of more than one metal cation in the structure of goethite are, however, scarce [1]. This study investigated substitution of Zn, Cu, Cr, Cd and Pb in the structure of goethite added at the nominal level of 2 mol% each and effect of their substitution on the goethite structure.

Results

X-ray powder diffraction (XRD) data indicated that goethite was the only phase present. The level of substitution of metal cations decreased in the order Zn>Cu>Cr>Cd>>Pb. A decrease in aging temperature from 70 to 25°C increased the overall substitution by 12.7 % (Figure 1), which indicates that goethite can sequester more metal cations at room temperature. The structural content of Zn and Cu decreased while that of Cr, Cd and Pb increased with decreasing aging temperature (Figure 1). Transmission electron microscopic studies revealed a significant decrease in crystal size while XRD studies indicated a significant decrease in crystallinity with decrease in aging temperature. Structural details gleaned from Rieveld analysis of synchrotron-based XRD data will be presented to outline the effects of metal substitution in the goethite structure.

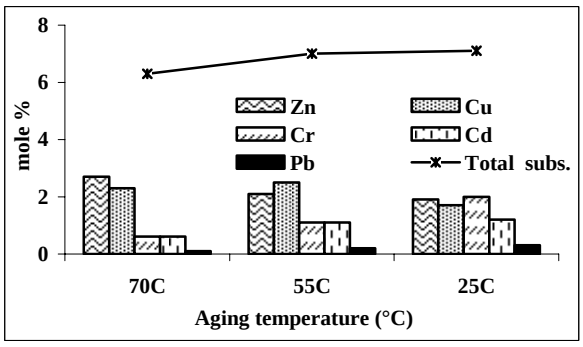

Fig. 1. Effect of aging temperature (°C) on the substitution levels of different metals (mol %).

References

[1] Cornell R.M. (1991) *Clay Min.* **26**, 427-430