

Title: The role of natural organic matter (NOM) in the sorption of copper to Brazilian oxisols

Author(s): Vasconcelos, Flavio de Moraes

Degree: Ph.D.

Year: 2000

Pages: 00001

Institution: Colorado School of Mines; 0052

Source: DAI, 61, no. 01B (2000): p. 173

Abstract: The inappropriate release of domestic and industrial wastes in Brazil is a severe environmental problem. Approximately three quarters of the domestic trash in Brazil is discarded without any attempt at mitigating the environmental hazards.

In Brasília, the capital of Brazil, the city's landfill has been in operation for the last 35 years without barriers for subsurface containment of leachate. Recently, studies by the University of Brasilia have detected concentrations of Cd and Pb above the maximum contamination level (MCL) allowable for drinking water in leachate directly beneath the landfill. However, monitoring wells downgradient of the landfill have produced only low levels of these toxic metals, leading to the speculation that leachate-saturated soils have a high capacity for sorbing toxic trace metals.

For this study, a soil profile inside the Brasília National Park, which borders the landfill, was characterized macroscopically in the field and sampled. Ten soil horizons were chemically and physically characterized and, of these, three were chosen for more detail characterization and description using electron microscopy.

A series of sorption edges and isotherms for Cu^{2+} sorption was made before and after partial oxidation of soil natural organic matter (NOM). The results show a relatively small contribution of NOM to the adsorption of copper by soil. This result is in agreement with other studies of acidic soils. However, the apparently limited role of NOM in sequestering metals in soils is not generally true. The lack of significance of NOM in copper sorption in this system is hypothesized to be caused by the abundance of iron and aluminum in the system. It is concluded that, in acid soils, iron and aluminum effectively compete against copper for strong metal binding sites on NOM.

Two sets of sorption edges for copper on soil samples from the A₁ horizon, one after NOM extraction, and the other after different types of additional NOM had been sorbed to the soil, support this hypotheses. The first set confirms the minor role that NOM plays in the sorption of copper in this soil and the second strongly suggests that the Fe and Al are competing with copper for the same binding sites.