Geophysical Research Abstracts, Vol. 7, 03778, 2005
SRef-ID: 1607-7962/gra/EGU05-A-03778

Influence of zero point salt effect on cadmium, copper, nickel and zinc distribution coefficient (Kd) in soil

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The heavy metal retention by soil colloids is an important process to environmental quality maintenance. Thus, the zero point salt effect (ZPSE) and distribution coefficient (Kd) determination are of great importance on ion retention study by variable charge soils, where high Kd values indicate high affinity of the metal ion with the soil. Adsorption isotherms were elaborated by reacting the soil samples with individual aqueous solutions of 0.01, 0.1 and 1.0 mol L^{-1} $Ca(NO_3)_2$ to an alfisol [Rhodic Kandiudalf (RK)] and a highly weathered oxisol [Anionic "Rhodic" Acrudox (AR)] of the State of São Paulo, Brazil, collected in surface and subsurface layer. The values of ZPSE and Kd were determined.

To RK the ZPSE was the same at two depths (3,6) and 3,6 to surface layer of the AR and 6,0 in depth. The values of Kd to surface and subsurface layers of the RK decreased with ionic strength elevation, indicating that low values of ZPSE resulted in higher levels of negative charge at the soil colloids, increasing the competition for calcium with its higher concentration in the soil. Conversely, the Kd value to subsurface layer (ZPSE 6,0) of the AR increased with ionic strength increasing. It happened because nitrate ion (more concentrate at higher ionic strength) links to positive charges, decreasing metal repulsion and increasing Kd to higher ionic strength. Copper was more adsorbed in both soils; cadmium presented lower retention by its predominant exchangeable behavior, while zinc and nickel showed intermediate values.