Effects of Amorphous Constituents on Some Mineralogical and Chemical Properties of a Panamanian Latosol*

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Abstract: This study was an investigation of the effects of sesquioxide constituents on some mineralogical and physiochemical properties of a Panamanian latosol.

Latosols are soils characterized by high concentrations of iron and aluminum oxides and a general absence of free silica and alkaline earths.

X-ray diffraction studies revealed sesquioxide coatings existed on the surfaces of the clay minerals. Mineralogically, the soil was composed of kaolin, amorphous minerals, hydrated iron and aluminum oxides, free silica, quartz grains, and magnetite. The results of DTA data suggested the presence of amorphous colloids in the soil. This suggestion was subsequently confirmed by selective dissolution analysis which revealed the unexpected presence of 17% amorphous silica in the coarse clay size fraction. Grain size analysis and scanning electron microscopy studies showed that the clay minerals are probably agglomerated by the sesquioxides into silt size clusters. CEC values obtained were primarily attributed to the amorphous colloids rather than the crystalline clay minerals because the sesquioxides probably partially blocked the exchange sites of the clays.

Removal of the iron and aluminum oxides by sodium dithionite citrate-bicarbonate procedures (Mehra and Jackson, 1960), (a) sharpened and exposed previously " masked " X-ray diffraction peaks, (b) disaggregated the clay clusters producing greater amounts of clay size particles, and (c) altered the Cation Exchange Capacity (CEC) and water retention characteristics of the soil constituents.

This investigation demonstrated that amorphous silica and iron and aluminum oxides greatly influence the properties of this latosol by coating and aggregating the clay minerals. These sesquioxide coatings suppress the ordinary behavioral characteristics of the indigenous clay minerals and consequently the observed behavior of the soil is dominated by the amorphous constituents.

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