
Iron oxide mineralogy in saprolites and soils over some metamorphic rocks

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Iron oxides are important constituents in saprolites and soils formed over rocks which contain iron-bearing minerals. In this study, three weathering profiles developed over amphibole schist, quartz-mica schist and phyllite were sampled.

Undisturbed samples were collected for thin section study and scanning electron microscopy while bulk samples were collected for XRD analysis. Iron oxides were concentrated from the clay fractions obtained from the bulk samples for detailed characterisation from XRD analysis.

The alteration of biotite grains to kaolinite and iron minerals can be observed in thin sections of the saprolites of the quartz-mica schist and phyllite. The cryptocrystalline iron oxides occur on the fringes of the biotite grains. Under the scanning electron microscope, goethite discoids were observed on the edges of the lamellae as well as on the surfaces of the biotite.

The iron oxides in the saprolite of the amphibole schist were formed from the alteration of actinolite. The actinolite crystals leave framework structures which under the SEM can be seen to be composed of goethite. Globules of hematite were disseminated in the groundmass.

Detection of goethite and hematite in the soil samples was through XRD analysis of the iron oxide concentrates. In thin sections, they occur disseminated in the fine fabric. XRD results show that goethite is the dominant mineral in all the samples. The mean crystallite dimension (MCD) perpendicular to the (110) decreases from saprolite (30 nm) to soil (12 nm). These goethites show a high aluminium substitution, ranging from 14 to 31% more.