Abstract

This project investigated the behaviour of K and NH_4 in six typical West Indian soils.

Five criteria were used to evaluate the mineralogy of the soils:- X-ray diffraction analyses; Differential Thermal analyses; surface areas; C.E.C's; and partial chemical analyses.

Kaolinite, montmorillonite, mica, and quartz dominate the mineralogy of the soils, with quartz being particularly predominant in fractions greater than 2 μ diameter.

The amounts of K fixed by the soil clays were related to their montmorillonite contents. The 2-0.2u clays fixed less K on a per unit weight basis, but fixed more on a per unit montmorillonite basis. This is related to the greater charge densities of the 2-0.2u montmorillonites.

K fixation resulted in mineralogical C.E.C., and surface area changes. The reductions in C.E.C. were equivalent to the amounts of K fixed.

The clays fixed much less NH_4 than K. The surface areas and mineralogical changes were correspondingly less pronounced.

The $\angle$ 0.2u clays released more K than their 2-0.2u counterparts. Samples treated with K (only) released more K than the untreated ones. This increase was however not great. Those samples treated with K+(NH_4) released K at a slower rate than the K-treated samples. Removal of 'free' iron resulted in more K being released by a number of samples.

The rate of release of K by the samples is diffusion controlled.

Fixation of K by the whole soils reflected their particle size and mineralogical composition. Drying the soils resulted in significant release of K at low levels of exchangeable K and significant fixation at higher levels. The point where release ceased is related to the C.E.C's of the soil.

380°C dry heat and hydrothermal treatments resulted in significant amount of K fixation. The mineralogical, C.E.C. and surface area changes which occurred were far more dramatic than those changes which occurred when K was fixed at 105°C. Reductions in C.E.C were not equivalent to the K fixed.