Stability of Mixed Iron and Aluminum Hydrous Oxides on Montmorillonite*

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* Journal Paper 5418, Purdue University, Agricultural Experiment Station, Lafayette, Indiana, U.S.A.

Abstract: Montmorillonite clay samples were coated with 16 m-equiv/g of clay or iron plus aluminum as hydrous oxides and aged 1 yr, in suspensions of pH 6 or 8. The magnesium exchange capacity (MgEC) decreased linearly with the amount of non-crystalline aluminum hydrous oxide associated with the clay. Eight to 16 m-equiv of iron per g of clay reduced the MgEC by 20 m-equiv/100g at pH 6, but did not affect the MgEC at pH 8. The quantity of non-crystalline aluminum associated with the clay depended on the suspension pH and aging time, and was unaffected by the coprecipitation of 8 – 16 m-equiv of iron hydrous oxide/g clay. The crystalline form of aluminum hydrous oxide depended on the suspension pH and was shown by X-ray diffraction to be gibbsite at pH 6 and bayerite at pH 8. Gibbsite and bayerite formed rapidly with a rate dependent on the suspension pH when excess non-crystalline aluminum hydrous oxides were present. The quantity of non-crystalline aluminum hydrous oxides remaining after one year in suspensions of iron hydrous oxides and montmorillonite varied from 2 · 3 m-equiv/g of montmorillonite at pH 8-4 · 0 m-equiv/g of montmorillonite at pH 6. Differential thermal analysis and MgEC measurements indicated some regular organization of the iron hydrous oxides, however, crystalline iron minerals were not detected by X-ray diffraction.

Clays and Clay Minerals; March 1975 v. 23; no. 1; p. 27-32; DOI: 10.1346/CCMN.1975.0230104

Clay Minerals Society (www.clays.org)