Optical Density of Vertisol Clay Suspensions in Relation to Sediment Volumes and Dithionite-Citrate-Bicarbonate-Extractable Iron

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Abstract: Clay fractions of eight vertisols and vertisolic soils from Israel were found to consist principally of a Fe-rich beidellite. Sediment volumes of Na-clay suspensions, obtained in measuring cylinders and read every 24 hr for as long as 720 hr, ranged from 3.8 to 8.4 cm^3/100 mg clay and were as much as 19 times larger than corresponding suspensions of Ca-clays. Optical density data for all clay suspensions showed absorption curves typical of smectite. The relative number of platelets per tactoid, calculated from optical density measurements, ranged between 1.4 and 5.4 for the Na-clays and between 7.4 and 14.1 for the Ca-clays. In the Ca-clays, the sediment volume decreased with an increase in the relative number of platelets per tactoid. With increase in the major dimension of particles (calculated also from optical density curves), sediment volume tended to increase for the Na-clays and decrease for the Ca-clays. These relationships can be explained on the basis of particle arrangement patterns: face-to-face arrangements dominated the Ca-clays and edge-to-edge and edge-to-face arrangements dominated the Na-clays. The amount of iron extractable in dithionite-citrate-bicarbonate (DCB) correlated positively with the relative number of plates per tactoid and with the major dimensions of the particles in the Ca-clay suspensions. This correlation suggests that DCB-extractable iron affects the tactoid dimensions of Ca-clays from vertisols and, therefore, may also affect structural properties of vertisols.

Key Words: Beidellite • Extractable Fe • Fabric • Optical density • Tactoid • Vertisol

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