
Microstructure and Pore Structure of Impact-Compacted Clays

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Abstract: The microstructures of impact-compacted kaolinite and illite clays, after drying, were investigated by pore size-distribution measurements, X-ray orientation determinations, and scanning electron microscopy. Clays compacted on the dry side of the optimum moisture content exhibited a domain structure with adjacent domains largely separated by micrometer-size interdomain voids; clays compacted at or above the optimum moisture content showed a more nearly massive structure, large interdomain voids being absent. Parallel orientation was observed within domains, but neighboring domains were generally tilted with respect to each other. In kaolinite compacted on the wet side of optimum, regions of local parallel orientation could be identified at high magnification as domain units. A significant volume of 200 Å-800 Å dia. pores in this clay was identified with spaces observed between the kaolinite plates within domains, for samples compacted both on the wet and dry sides of optimum. The subdomain structure was tentatively classified as " intergrown" in character. (001)/(020), (002)/(020), (001)/(060), and (002)/(060) orientation indices were calculated for the compacted kaolinite and compared with analogous measurements for fully-random and fully-oriented specimens of the same clay. The results indicated only a small degree of preferential orientation normal to the axis of compaction, with little difference between samples compacted either wet or dry of optimum. These results were consistent with scanning electron microscope interpretations, which suggested that the domains did not appear to orient themselves significantly under the influence of the compaction employed.

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