
The Crystallinity of Minerals—A New Variable in Pedogenetic Processes: A Study of Goethite and Associated Silicates in Laterites

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Abstract: The crystallinity of minerals in terms of crystallite size distribution and lattice perfection is quantified by means of statistical measures derived from X-ray line profiles (2σ values). A low degree of crystallinity facilitates the non-stoichiometric incorporation of foreign elements in the crystal lattice. Crystallinity is affected by a number of factors and in natural profiles it may vary laterally as well as vertically.

For instance, goethite in laterite deposits shows decreasing crystallinity with increasing depth. Serpentine type minerals, on the other hand, show the lowest crystallinity at the surface where the degree of weathering is the most advanced. The presence of silica in migrating solutions prevents crystal growth and results in a low degree of crystallinity of minerals such as goethite. This has been observed in natural profiles and has been confirmed by laboratory experiments on the synthesis of goethite and sodium-birnessite. The crystallinity of minerals affects their response to extractive procedures. It could also be an important parameter in soil science.

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