
Low-Charge to High-Charge Beidellite Conversion in a Vertisol from South Italy

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Abstract: The fine silt (2– 5 µm) coarse clay (0.1– 2 µm) and fine clay (<0.1 µm) fractions of a Vertisol from South Italy were studied with X-ray diffraction. The most reactive fine clay (<0.1 µm) fraction was investigated in detail using a curve decomposition method analysis of X-ray diffraction diagrams, FTIR spectroscopy and chemical analysis. In the soil parent material, the fine clay fraction was dominated by low-charge smectites (beidellite and montmorillonite) whereas, high-charge beidellite was the dominant clay mineral in the fine clay from the upper soil horizons. This suggested that high-charge beidellite was produced through alteration of the preexisting low-charge smectites and was the stable clay phase in this soil environment, characterized by high pH (>8.0). After K-saturation and 25 wetting and drying cycles, the high-charge beidellite from the soil horizons lost expandability far more than the original low-charge smectites.

Key Words: Beidellite • Smectites • Vertisol

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