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The influence of Fe-oxides and organic matter on surface properties of nanostructured microaggregates of the Terra rossa and Calcocambisol

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This study investigates the influence of Fe-oxides and organic matter on surface properties of nanostructured mineral microaggregates obtained from the Terra rossa and Calcocambisol developed on hard limestone and dolomite in Istria, Croatia.

The mineral composition and the morphology of samples (B horizon) were investigated using X-ray diffraction and field emission scanning electron microscope (FE-SEM), respectively. In order to determine the influence of Fe-oxides and organic matter coatings on surface properties of soils, samples were selectively dissolved. Particle size distribution, specific surface area (SSA), and electrophoretic mobility (EPM) were measured on the following soil subsamples: original samples, samples treated with H_2O_2, samples treated with H_2O_2+NH_4-oxalate, and samples treated with H_2O_2+NH_4-oxalate+Na-dithionite-citrate-bicarbonate.

The obtained results showed that kaolinites (kaolinites which form intercalation compounds with DMSO-KI_D and kaolinites which do not intercalate with DMSO-KI) (RANGE et al., 1969), illitic material (ŚRODOŃ, 1984; ŚRODOŃ & EBERL, 1984), and Fe-oxides are the main mineral components in the clay fraction of the terra rossa. Calcocambisol enriched in organic matter contains kaolinites, chlorite and vermiculite as main mineral phases. The main differences in surface properties between the Terra rossa and Calcocambisol were a consequence of diverse particle-size distribution, mineral composition, and the share of organic matter. FE-SEM analysis of the Terra rossa and Calcocambisol samples after removal of amorphous Fe-oxides and organic matter shows disintegration. This disintegration is evident in reducing particle size from 2 μm to 50 nm for the Terra rossa and from 1.8 μm to 50 nm for Calcocambisol, respectively. Kaolinite with particle size about 50 nm shows pseudohexagonal form in analysed soils. The SSA increased proportionally to the amount of the removed organic matter in both soils. After the removal of well-crystallized Fe-oxides the SSA slightly decreased in Calcocambisol and significantly increased in the Terra rossa due to major soil microaggregate decomposition. EPM measurements of investigated samples were diverse.

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