

Thermal Properties of Non-aggregated and Aggregated Soils: Effects of Particle Size and Shape

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Thermal properties of soils including thermal conductivity and heat capacity are very important for understanding heat transport processes at landfill sites, hereunder promoting the site stabilization, and for optimizing heat treatment technique at polluted sites.

Previous studies have shown effects of soil conditions such as moisture content and degree of compaction on the thermal properties for differently-textured soils. However, there are few studies on the relations between the thermal properties and micro-scale soil information such as particle size and shape although the size and shape of soil particles highly affect soil packing configuration (solid-phase tortuosity and contact number).

In this study, non-aggregated and aggregated soils with different size fractions at variably-saturated conditions were used for measuring thermal properties. Micro-scale characterizations of soil-pore structure and soil particle configuration using a X-ray-CT device were performed. Mineral composition such as quartz content was also measured for the samples. The relations between the obtained thermal properties for soils under different moisture conditions and their soil structure functions and mineral compositions were investigated.

Keywords: Thermal property, Thermal conductivity, Particles size, Particle shape, Soil-pore structure, Moisture condition