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火山灰土壌における有機－無機相互作用．Part I．粒子比重と表面特性
Nature of organo-mineral interaction in volcanic-ash soil. Par I. density and surface property of particles

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Organic carbon (OC) in soil is mainly present as aggregates of organic matter with soil mineral particles. Volcanic-ash soil is characterized by allophane/imogolite, the smallest soil minerals on earth, and by unusually high organic carbon (OC) concentration compared to non-volcanic soils. Based largely on correlation studies, the high OC of volcanic-ash soil is generally explained by protective effect of the inorganic constituents unique to this soil (e.g., short-range-ordered minerals and dissolved aluminum) via sorption of OC on mineral surfaces and organo-metal complexation. Yet little direct evidence is available on the mechanism of OC stabilization or the nature of organo-mineral interactions in volcanic-ash soil. Fractionation of soil according to particle density is an effective approach to distinguish the OM of different degrees of mineral associations and to elucidate SOM stabilization processes. Here we examined a surface (Ap) horizon of an allophanic Andisol in central Japan by isolating six density fractions (from <1.6 g/cc to >2.5 g/cc). We previously reported the progressive increase in delta C-13, N-15, and radiocarbon age from low to higher density. At this presentation, we focus on physical and mineralogical characteristics of the organo-mineral aggregates. We use N2 gas sorption approach to assess the extent of organic coverage on mineral surfaces in addition to the measurements of the specific surface area. Using selective dissolution techniques (acid oxalate and pyrophosphate), we quantify the abundance of short-range-order minerals and to estimate the amount of organic matter sorptively stabilized by these minerals in each fraction. Together with SEM/EDS characterization of each fraction, we attempt to summarize the progression of organo-mineral interaction from fresh plant detritus to stable organo-mineral aggregates.

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