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Contents

The Distribution of Aluminum Citrate Degrading Bacteria in Kanto-Loam Layer

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Abstract

The distribution of aluminum citrate degrading bacteria is investigated in Kanto-loam layer in Noda City Chiba Pref., Japan. Citrate is one of the low molecular weight organic acids (LMOAs) that promote degradation of primary alumino-silicate minerals by forming aluminum-LMOA complex in weathering degradation process. On the other hand, LMOAs are known to inhibit the secondary mineral formation such as imogolite and allophane by keeping the solubility of aluminum high and preventing aluminum from serving as a component of the secondary minerals. As the secondary minerals are found widely in Kanto-loam layer and other volcanic ash layers, the degradation of aluminum-LMOA complex seems to be a key process of their formation in the secondary mineralization process. In this study, the existence of aluminum citrate degrader was confirmed by using aerobic agar plates which contained aluminum citrate as sole carbon and energy source. This microorganism, which grew also in the liquid medium, was counted at least 0.6 % - 2.4 % of the aerobic heterotrophic population. Although the vertical distribution of aluminum citrate degrader within the sedimental layer was not consistent with the secondary mineral distribution, the role of microbial activity in the secondary clay mineral formation is suggested.

Keyword : Aluminum citrate, Degradation, Heterotrophs, Secondary minerals, Weathering

Arsenic distribution in the upper part of the Yurakucho Formation in the Koto Delta, Tokyo

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Abstract

The purpose of this study was to estimate the arsenic concentrations in sediments and in leachate in the Yurakucho Formation and man-made strata under the Tokyo lowland.

In the study area, the upper part of the formation, which is a Holocene deposit, consists of, in ascending order, a clay layer, a silt layer, a sand layer, and a dark brown silt layer. Man-made strata overlay the formation. The core description, radiocarbon dates, diatom analysis, and pollen analysis suggest that the clay layer was deposited in the inner bay during the Jomon transgression. Later, by advancement of the delta into Tokyo Bay, the silt, sand, and dark brown silt layers were deposited; these are progradational delta deposits.

The arsenic concentrations in each layer of sediment and in leachate were as follows: clay layer, 8.6–19.8 mg/kg and 0.016–0.112 mg/L; silt layer, 9.5–34.5 mg/kg and 0.007–0.122 mg/L; sand layer, 6.6–33.2 mg/kg and 0.001–0.044 mg/L; dark brown silt layer, 8.7–16.8 mg/kg and 0.008–0.021 mg/L; man-made strata, 2.1–26.2 mg/kg and 0.000–0.021 mg/L.

There were no specific differences in the concentrations in sediments between layers. The leachate concentrations tended to be low near the layer boundaries, but high in the middle of each layer. It is possible that they are affected by the groundwater flow system, especially groundwater basal flow, which flows more easily at the boundaries. That is, the higher flow near the boundaries reduces the arsenic concentrations in leachate.

Keywords : Koto delta, Yurakucho Formation, Arsenic concentration in sediment, Arsenic concentration in leachate, Groundwater flow

Liquefaction of ground during the Mid Niigata prefecture Earthquake and the Niigata Earthquake in Niigata Plain, Niigata Prefecture, Northeast Japan

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Abstract

In low-lying Niigata Plain, the ground frequently liquefied during earthquakes. Some problems on liquefaction are discussed on the basis of liquefaction phenomenon caused by the Mid Niigata prefecture Earthquake of 2004 (M = 6.8) and the Niigata Earthquake of 1964 (M = 7.5). The liquefaction occurred mainly in former river course (abandoned channel) and reclaimed land, and also the occurrence is closely related to the geomorphic elements, the magnitude of earthquake, distance from the epicenter, the age of ground (passing years after reclamation), thickness of the loose sand and the underground water level. Sand boiling was also observed on top of dune, embankments of river, fillings and refilling earth. These facts suggest that the liquefaction resulted from small aquifer (perched water) which was independent of the circumstances. At the riverside land of the Shinano River, the selfsame site was liquefied by the earthquakes of 1964 and 2004. The re-liquefaction was only found when the intervals of earthquakes were less than several decades.

Keyword: liquefaction, geomorphic element, age of ground, perched water, re-liquefaction, Niigata Plain