

Management and application of environmental science information using Geo-database system

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When heavy metals are detected and exceeded the allowable limits set by domestic Environmental Agency in each country from soil and sediments, it is necessary to judge whether contamination is caused by human-activities or natural geochemical process. The soils and sediments, even though naturally contaminated, needed to be managed appropriately since it may have influence on peoples health. Therefore, it is important to correct and management about background data which is the content and the leachability of harmful heavy metals contained in natural soil, sediments and rocks for environmental science. Furthermore, it will be helpful that optimization of polluted soil volume and treatment fee, additionally prevention of the land will become as the Brownfields.

According to these backgrounds, we examined the Geo-database system aiming at grasping distribution of the natural origin heavy metals over a wide area. To evaluate distribution of naturally contaminated soils and sediments by heavy metals like these, we have to develop Geo-database systems to store not only conventional form of geological/geotechnical information but also geochemical one. In this study, to evaluate various kinds of geochemical properties about soil and sediment samples, two types of analytical procedures, i.e. dry analysis and wet analysis, were carried out. In the dry analysis, 10 major elements (SiO₂, TiO₂, Al₂O₃, Fe₂O₃, MnO, MgO, CaO, Na₂O, K₂O, P₂O₅) and some minor elements (such as As, Pb and S etc.) were measured using the wave-length-dispersive-type X-ray fluorescence analysis (XRF). In the wet analysis, heavy metals and other chemical elements in solution were analyzed through the leaching test based on the method defined by the method No.18 of the Ministry of Environment Japan. Moreover, the availabilities of soil and sediment samples which were taken through the standard penetration test for geochemical analysis were examined. In this presentation, we will introduce some management techniques of these geochemical information using geological/geotechnical information system and its example of application.

On the other hand, as an example for application study of Geo-database system for the use of environmental science, some basic investigations of naturally contaminated arsenic at middle-upper part of the Arakawa Lowland were conducted. As a result, although contents of harmful heavy metals and main chemical elements did not change with progress of years, it became clear that leaching properties changed due to sample oxidation. Additionally, we proposed the method for differentiating naturally arsenic containing soil and anthropogenically one based on the total content of arsenic and sulfur with reviewing of geochemical data in this study area.

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