

665th ASRC Seminar

Date: Thursday, February 23, 10:30 ~

Location: Room 103, ASRC bldg.

Speaker: Prof. Tsutomu Sato
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Title: Let's use metastable geomaterials in environmental protection –An intelligent geotechnology learnt from natural processes-

Abstract: For our sustainable development, engineering technology in environmental protection (purification, remediation and so on) should be in safety, low-cost and minimum load on the environment for human living together with the Earth. In such technology, not synthetic materials but rather ubiquitous geomaterials should be used. If we can establish the technology using geomaterials for human living together with the Earth, the technology can be called “geotechnology”. Natural process is a physical, chemical and biological process existing in nature without the intent of human beings. Therefore, natural processes teach us an intelligent geotechnology with low-cost. In the natural processes, of course, ubiquitous geomaterials play a key and major roles.

Several kind of geomaterials such as clay, iron, carbonate minerals have been used for engineering technology up to now. Those materials are generally stable at the condition of Earth's surface. Engineers in environmental protection would like to use such kind of stable materials because of low-cost and stability in performance. However, in nature, metastable materials have been frequently found with higher performance due to their much higher reactive surface area and reactivity towards the hazardous materials. For example, for iron oxides, hematite, goethite, ferrihydrite and schwertmannite, are one of the most important naturally occurring sorbents of arsenate and phosphate. Among these phases, hematite and goethite are crystalline and stable materials, whereas ferrihydrite and schwertmannite are metastable materials with poor crystallinity. Metastable ferrihydrite and schwertmannite show higher performance for arsenate and phosphate adsorption. Similarly, not calcite but rather aragonite and monohydrocalcite show higher performance for anion adsorption.

Recently, it is well known that the stability of metastable materials is easily changed by adsorption of several anions. Therefore, we can expect the high performance for long-term. In this presentation, an intelligent geotechnology learnt from natural processes by using metastable geomaterials will be introduced with example of natural iron oxides and calcium carbonate.

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