[EE] Evening Poster | A (Atmospheric and Hydrospheric Sciences) | A-GE Geological & Soil Environment

# [A-GE31]Subsurface Mass Transport, Material Cycle, and Environmental Assessment

convener:Yuki Kojima(Department of Civil Engineering, Gifu University), Shoichiro Hamamoto(Department of Biological and Environmental Engineering, The University of Tokyo), Hirotaka Saito(東京農工大学大学院農学研究院, 共同), Yasushi Mori(Graduate School of Environmental and Life Science, Okayama University)

Mon. May 21, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

This session covers the topics on mass transport, water and energy cycles in geoenvironment. Subjects related to laboratory and field measurements, theoretical analysis, and numerical modeling will be discussed. Presentations on geo-pollution, remediation, geological disposal of hazardous wastes, ground source heat utilization, mass transport in vadose zone, soil-water monitoring, and environmental assessment are encouraged.

# [AGE31-P11]A RELATIONSHIP BETWEEN DENSITY AND CT BRIGHTNESS FOR CONSOLIDATED BENTONITE MATERIALS

*Shin Ishizuka[1], Ken Kawamoto[1,2] (1.Graduate School of Science and Engineering, Saitama University, 2.International Institute for Resilient Society, Saitama University, Japan)

Keywords:Bentonite, Consolidation, Microfocus X-ray Computed Tomography

Geological disposal of high level radioactive waste is considered a way for a safe waste management in many countries. In the repository concept for the disposal, canisters emplaced in the galleries are to be surrounded by a bentonite buffer. Self-sealing and low permeability of the bentonite due to high swelling and water absorption ensure its performance as a buffer material for the disposal. The swelling and water absorption cause spatial and temporal variations in internal density of the bentonite. Especially, it has been reported that the water absorption into dried granulated bentonite resulted not only in an increase of the moisture content but also homogenization of the internal density. Because the spatial and temporal variations in the internal density highly affects mass transport processes in the bentonite, it is important to have a quantitative data on the internal density of the bentonite under water adsorption.

In this study, CT brightness values obtained from a Microfocus X-ray Computed Tomography (MFXCT) system were used to characterize the internal density of granular bentonite. First, air-dried fines less than 425 μm fraction were collected from two granulated bentonites, FE GBM (produced in US and processed in Germany) (Muller et al., 2017. Swiss Journal of Geosciences) and OK bentonite (Japan). Then, the fines were mixed with distilled water to prepare slurry materials (those water contents equal to the values of liquid limit values in Atterberg limits). The slurry samples were packed in a mold of oedometer and consolidated under different loads. Air-dried samples were hand-packed to different dry densities. Those consolidated and hand-packed samples were used for the MFXCT scanning and histograms of the CT brightness were obtained.
Results showed that the CT brightness values increased and shape of the histograms became sharp (narrow distribution) with increasing in density for both consolidated slurry samples of FE GBM and OK bentonite. A good relation can be obtained between mean values of histograms of CT brightness and dry

densities with ranging from 0.1 to 0.6 g/cm$^3$ (void ratio became 3.5 to 17.4). This indicates that those statistical parameters (mean and standard deviation) from the histograms of CT brightness became good indicators to examine the difference in density for bentonite fines. On the other hand, a unique relation between the mean values of the histograms and dry densities was observed for the hand-packed air-dried samples, however, the relation differed from that for the consolidated slurry samples.