

An observation of swelling behavior and microstructural change for granulated bentonite mixtures under controlled relative humidity

*Mazhar Nazir¹, Akihiro Matsuno¹, Takeshi Saito¹, Ken Kawamoto¹

1. Graduate School of Science and Engineering, Saitama University

The granulated bentonite mixtures (GBM) are considered as potential sealing materials in the radioactive waste disposal concepts due to their high swelling capacity, low permeability and good compaction properties. Therefore, it is necessary that the hydro-mechanical behavior of GBM should be thoroughly examined for an efficient design of the repository. This study investigated the swelling behavior and microstructural change of a GBM. OK Bentonite from Kunimine Industries, Japan, was used in this study. First, OK Bentonite grains were sieved and the particle size distribution was adjusted to follow a fuller curve (similar to FE-GBM used by NAGRA, Switzerland). Air-dried GBM samples (RH = 60%, T = 20° C) were packed at dry density 1.2 and 1.3 g/cm³ in the apparatus and then stored at RH = 95% to observe the swelling behavior and microstructural changes with time (t = 0, 1, 2, 4, 8 weeks). A constant volume rigid cell was used to measure the swelling pressure. The microstructural changes were observed by Microfocus X-ray Computerized Tomography (MFXCT) system. The results provided a quantitative observation of microstructural changes in the GBM under the swelling process at a controlled relative humidity and a better insight to understand the complex hydro-mechanical behavior of the GBM.