Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

HCG34-P01 Room:Convention Hall Time:May 26 18:15-19:30

Identifying influence factors on permeability of granite core samples

MATSUDA, Norihiro[1*] ; KUBO, Taiki[1] ; KASHIWAYA, Koki[1] ; KOIKE, Katsuaki[1]

[1]Kyoto University

A safe geological disposal of high-level radioactive waste for long term requires to evaluate the stability of facilities based on the estimation of groundwater flow and mass transport. For the evaluation, it is indispensable to understand a regional groundwater system and a slow diffusion phenomenon of radionuclide in the matrix of the rock body. However, the relation between a permeability and macro/micro cracks in the rocks has not yet been clarified and the estimation accuracy of flow path is low. The main purpose of this study is to clarify the relationship by measuring spatial variation of permeability of granite rocks and examining the dependence of permeability upon crack systems with different scales.

For the purpose, we used the core samples taken from a borehole in the Tono area (Gifu, central Japan) drilled by Japan Atomic Energy Agency (JAEA). This area is mainly composed of Toki granite. Fault zones were drilled through the borehole. First we measured the permeabilities of the 36 cores and compared them with the geological features. Next, in order to identify the influence factors on the permeability of the rock matrix, thin-sections were produced from the cores after the infiltration of fluorescent into the cores and cracks were extracted from the thin-section images. Furthermore, micro-scale features of the rocks were compared with anisotropy of the permeability. We defined mesocrack as a visible crack with cm scale and microcrack as an invisible cracks with mm scale, respectively. As the result, the permeabilities were enhanced in accordance with the degradation of rocks by the advanced weathering and alteration and the presence of faults. High permeabilities were also measured in the parts of thin-sections in which the mesocracks were developed. As for the microcracks, although the fluorescent infiltrated into the microcracks, their attributes such as length, density, and angle did not have clear relationship with the magnitude of permeability.

These results suggest that mesocracks act as a path of fluids, while individual microcrack cannot have this function: formation of continuous network of microcracks is needed to enhance the permeability. Our next step is to add samples and undertake image analyses more in detail to verify the interpretation.

Acknowledgement: We would like to express our sincere thanks to the co-researchers of Japan Atomic Energy Agency for their supports and many constructive comments for this study.

Keywords: Permeability, Granite, Tono Area, Image analysis, Crack characteristics