## Characteristics of Water Retention Capacity for Korean Compacted Bentonite

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### 1. Introduction

Engineered barrier system (EBS) is suggested to dispose high level radioactive-waste (HLW). EBS is composed of a disposal canister, a buffer material, a backfill material, and a near field rock mass. The compacted bentonite buffer is one of the most important components of EBS for the disposal of HLW. As the compacted bentonite is located between a disposal canister with spent fuels and host rock, it is indispensable to assure the disposal safety of HLW. It can restrain the release of radionuclides and protect the canister from the inflow of groundwater. Because of inflow of groundwater into the compacted bentonite, it is essential to investigate water retention capacity of the compacted bentonite in order to evaluate the entire safety performance of EBS. Therefore, this paper conducted laboratory experiment in order to evaluate water retention capacity of Korean compacted bentonite, and compared previous researches.

### 2. Results and discussion

In Korea, Ca bentonite buffer materials have been produced in Gyeongju by CLIRIANT KOREA. Ca bentonite is named as KJ-I produced before 2015, and KJ-II after 2015 [1]. Table 1 shows geotechnical properties considering the Atterberg limit [2], and Korean bentonite is classified as CH with very high plasticity based on the unified soil classification system (USCS) [3].

WP4C equipment (decagon devices Inc., USA) was used to investigate water retention capacity for Korean compacted bentonite. The WP4C equipment is based on the chilled-mirror dew point temperature condensation principle to measure total suction, it measures water potential by equilibrating the liquid phase water of the bentonite with the vapor phase water of the chamber. Total suction can be calculated using Kelvin equation, which is the thermodynamic relationship between total suction and relative humidity of the vapor space in the bentnoite [4]. The water retention capacity for KJ-II bentonite was measured under the partially confined condition with initial dry density of 1.72 g/cm$^3$. Fig. 1 shows the wetting and drying path. The suction of drying path showed higher than that of wetting path because of several reasons such as the inhomogeneous geometry of bentonite pores and the structural change due to the swell and contraction of bentonite. Fig. 2 shows different water retention curve (WRC) with previous research [5] using KJ-I bentonite.

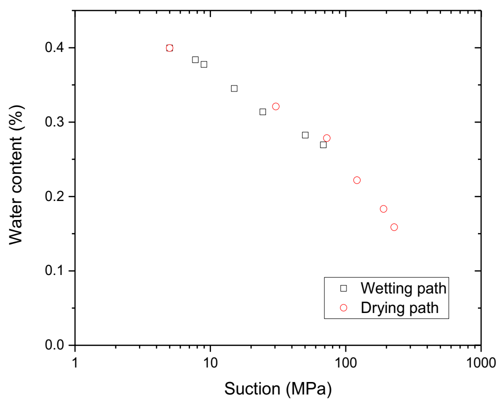


Fig. 1. Retention curve in a wetting and drying path for KJ-II .

Table 1. Geotechnical properties of Korean bentonites

| | Specific Gravity | Liquid Limit (%) | Plastic Limit (%) | Plastic Index (%) | USCS |
|---|---|---|---|---|---|
| KJ-I | 2.74 | 244.5 | 46.1 | 198.4 | CH |
| KJ-II | 2.71 | 146.7 | 28.4 | 118.3 | CH |

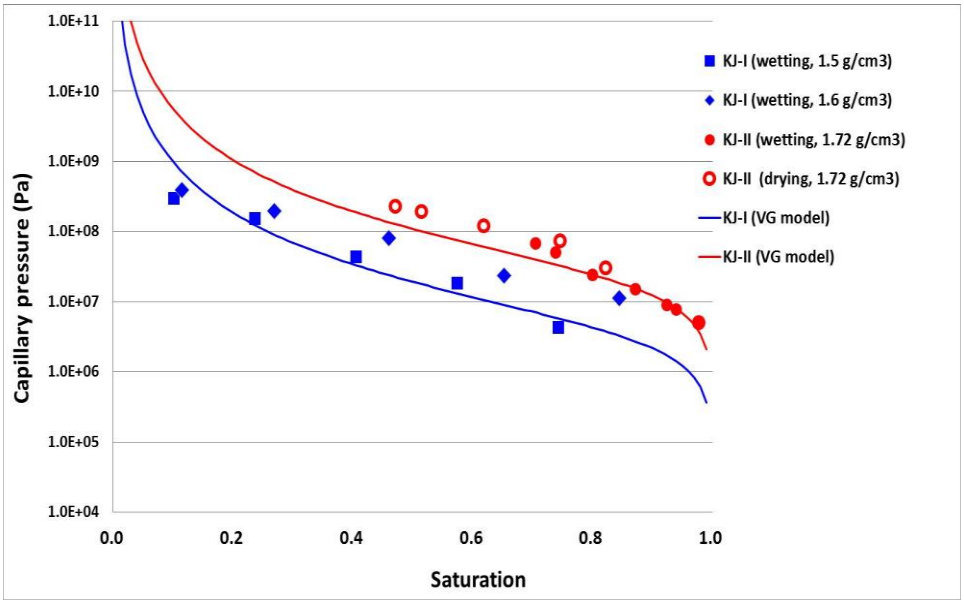


Fig. 2. Retention curve for KJ-I and KJ-II bentonites.

## 3. Conclusion

This paper investigated water retention capacity for Korean compacted bentonites such as KJ-I and KJ-II. Since hysteric behavior of compacted bentonite buffer in a real repository system is important, WRC was derived in a wetting/drying path for KJ-II, and various retention curves were investigated with different initial dry density. It is though that retention curves of compacted bentonites are determined according to the drying or wetting path, dry density or void ratio, and so on. Therefore, it is necessary to evaluate retention curves considering various affecting factors.

## ACKNOWLEDGEMENT

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