

## Experimental study for geomechanical properties of near-field of HLW disposal hole by centrifuge model test

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Around the high-level waste (HLW) geological disposal repository ("near-field"), it is expected that heat generation of HLW package (overpack), reflow of underground water, swelling of bentonite buffer and backfilling material, and deformation of host rock keep occurring for ultra-long term. These influence behavior of disposal hole, bentonite buffer, and bleeding channel. Therefore, it is necessary to evaluate an ultra-long term geomechanical behavior in near-field for tens to thousands years. The objective of this study is to evaluate geomechanical properties of near-field of HLW disposal hole by centrifuge model test. This paper reports the result of pressure-loading test in a centrifugal condition using the nylon specimen as a pre-experiment. We use the large-sized centrifugal equipment, "CENTURY-5000THM". The main features of "CENTURY-5000THM" are as follows: (1) 3.2 m of maximum effective rotation radius, (2) 100 G of maximum centrifugal acceleration, (3) 150 G-tons of maximum loading capacity, and (4) long-time operation up to six months. The pre-experiment was conducted for 12 days under the centrifugal acceleration conditions of 30 G. In the experiment, we enclosed the nylon specimen with the pressure vessel, and gave a centrifugal acceleration. The pressure vessel is a true-triaxial type of rigid loading plate by water pressure. We loaded the pressure of four patterns as follows: 5 MPa and 10 MPa in isotropic pressure, 5 MPa of overburden pressure and 2 MPa of lateral pressure in anisotropic pressure, and 10 MPa of overburden pressure and 2 MPa of lateral pressure in anisotropic pressure. The nylon specimen is a cube of 300 mm, and the weight is about 30 kg. We measured the values of strain and temperature of the nylon specimen under these pressure conditions. The temperature in the pit of centrifugal equipment is controlled by 25 degrees-C. In the isotropic pressure condition of 5 MPa, the delta strain showed  $200-400 \times 10^{-6}$ . Similarly results of  $200-400 \times 10^{-6}$  were observed in the isotropic pressure condition of 10 MPa. In the anisotropic pressure condition of 5 MPa of overburden pressure and 2 MPa of lateral pressure, the delta strain showed  $700-1400 \times 10^{-6}$ . The delta strain values of  $1400-3000 \times 10^{-6}$  were observed in the anisotropic pressure condition of 10 MPa of overburden pressure and 2 MPa of lateral pressure. Our data demonstrated the possibility of the centrifugal model test on a long term by the pressure-loading test under the centrifugal acceleration condition for 12 days, and measurements of strain for the nylon specimen even in case of the true-triaxial stress conditions of rigid loading plate.

Keywords: High-level radioactive waste, Near-field, Centrifuge model test, Geomechanical properties