

S6. Effect of Humidity on Radon Exhalation Rate from Concrete

Yamanishi, H., Obayashi, H., Sakuma, Y., Uda, T., Hirabayashi, H., Nakatsuka, H., Tsuji, N., Nakayoshi, H., Achiwa, K. (Japan Air-conditioning Service Co. LTD.)

The experimental hall for nuclear fusion experiments is required to keep airtight in order not to leak airborne radioactivities which are induced by neutrons. It is necessary to monitor air change rate and air quality in that room. Tracer gas methods are generally applied for measuring method of air change rate. We have investigated measuring method of air change rate using radon (^{222}Rn) as a tracer gas. In order to get to the goal, it is necessary to evaluate factors of time variation of radon exhalation rate.

The objective of the present study is evaluation of seasonal humidity effect on radon exhalation rate from concrete. Figure 1 shows the system of controlled humidity environment. Three sealed boxes are placed in a container whose temperature is controlled $30\text{ }^{\circ}\text{C}$. The three fixed humidities are selected 3, 10, 25 g m^{-3} in absolute humidity, those correspond to dry condition as control, winter and summer, respectively. In each box, a concrete piece (No.2, No.3 and No.4) whose size is 15 cm diameter and 5 cm thickness has been set. Radon exhalation rate from each concrete piece is measured every one month during this humidity exposure.

No.2 sample has been exposed to dry circumstance. No.3 and No.4 have been set low

humidity and high humidity, respectively. After 500 days exposure, No.4 sample was moved to low humidity place. Figure 2 shows the results, measured water content (W) and radon exhalation rate (E) are plotted with elapsed time. W and E are increased with elapsed time. In the high humidity, they are increased up to 2.4 % and $0.43\text{ mBq m}^{-2}\text{ s}^{-1}$, respectively. In the low humidity environment, they are saturated early period and increased up to 0.88 % and $0.13\text{ mBq m}^{-2}\text{ s}^{-1}$, respectively. It takes 80 days for low humidity, 180 days for high humidity to saturate these value.

After saturation of W, E follows the variation of water content. W and E of No.4 sample are decreased to 1.65 % and $0.25\text{ mBq m}^{-2}\text{ s}^{-1}$ after placed low humidity.

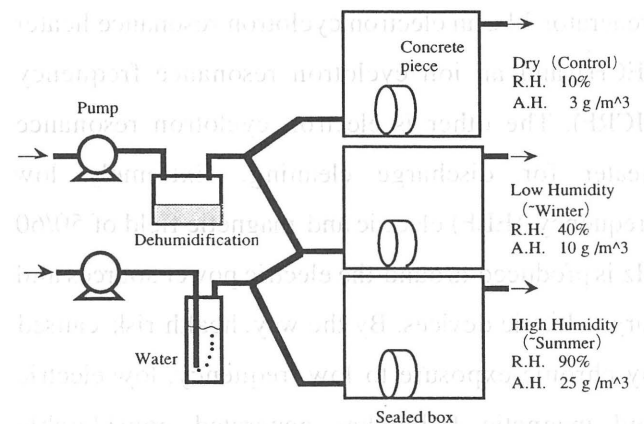


Fig. 1 Humidity exposure system

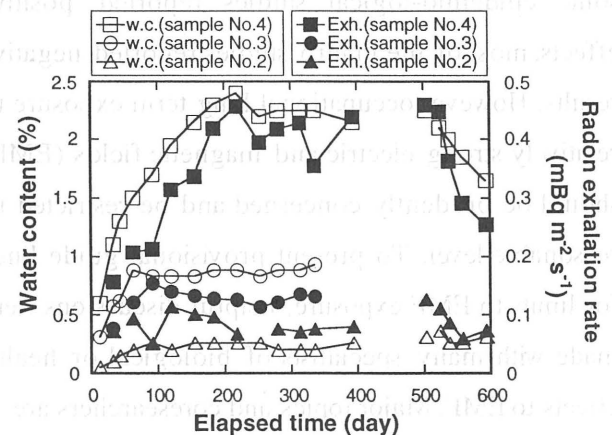


Fig. 2 Rn exhalation rate and water content