

Experimental study on the characteristics of radon cover in waste landfills

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Abstract

Waste from resource extraction industries contain uranium and thorium decay chain radionuclides. One important radiological impact of these wastes is the release of radon into the atmosphere. Therefore, prediction/evaluation of radon flux and effectiveness of different covers are the major elements in radiation protection, long-term safety aspects, and to model radon release to the environment for final assessment of radiological impacts and required remediation actions [1,2]. The authors designed a measurement system by short-time accumulation technique based on transient-diffusion method and the validity of the laboratory model to quickly estimate the radon release from soils, diffusion coefficient, and the effect of covers was investigated [3]. It was observed that after 0.5 m and 1 m clay cover layer with diffusion coefficient $(1.78 \pm 0.24) \times 10^{-6} \text{ m}^2 \text{ s}^{-1}$, the measured radon flux density from bare waste, $1.05 \pm 0.23 \text{ Bq m}^{-3}$, decreases by a factor of 1.7 and 2.8, respectively, to $0.61 \pm 0.12 \text{ Bq m}^{-3}$ and $0.37 \pm 0.06 \text{ Bq m}^{-3}$. Concerning to the measured radon diffusion length, the radon flux reduction factor increases to 10 for 1.6 m clay cover layer. The results show that the effectiveness of the studied cover layer is 3, which is similar to theoretical and experimental results in uranium tailings pond [4].

Keywords: transient-diffusion measurement, radon exhalation, diffusion coefficient, cover effectiveness

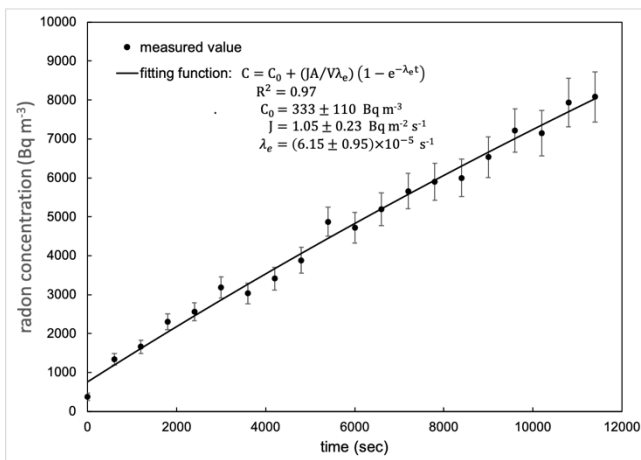


Figure 1. Measured transient-diffusion radon concentration for soil

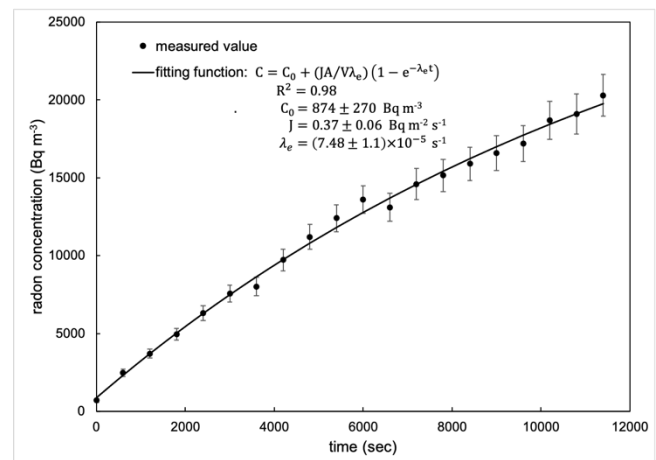


Figure 2. Measured transient-diffusion radon concentration after 1 m of clay cover layer

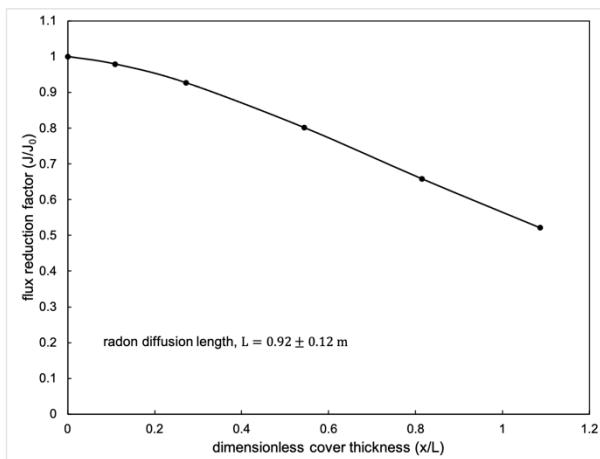


Figure 3. Radon flux reduction factor for various cover thickness

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