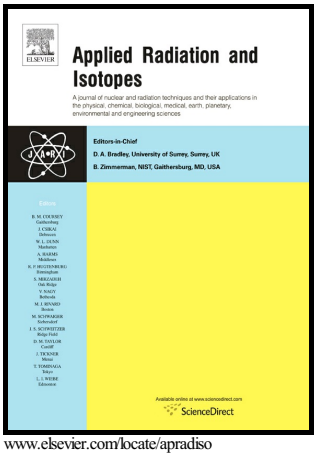

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Methods of Kernel Parameter Calculation for Stabilization Technology of Radon Concentration in a Closed Radon Chamber☆

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Abstract:

A radon chamber is a standard apparatus for experimental research of radon that can simulate ambient conditions such as atmosphere, ground surface and subsurface, and the dynamic stabilization technology of radon concentration in a radon chamber is the core technology of radon chamber research. In this paper, an attenuation method was proposed based on a radon leakage attenuation model for calculation of leak rate, a kernel parameter of the stabilization technology of radon concentration in a closed radon chamber, as well as a bench method based on a radon replenishment model for calculation of the effective generation rate at radon source, another kernel parameter of stabilization technology. In this study, the present methods were applied to parameter calculation in an HD-6-type small/medium-sized radon chamber, achieving an excellent application effect.

Keywords: Closed radon chamber, parameter calculation, leak rate, effective generation rate

1 Introduction

Radon drew universal attention upon its discovery, and since then it has been widely used in environmental monitoring, water exploration, product detection and other relevant fields (Huishan et al.1995; Amin et al.2017; Zeeshan et al.2017). During its widespread application, radon has been identified as a gas greatly harmful to public health, since the internal radiation caused by atmospheric radon and radon daughters inhaled by people is the main part of the natural radiation to which the public is exposed. With there being increasingly high requirements for the measurement accuracy of radon concentration, it has been expected to set up a standard apparatus for experimental studies of radon that can simulate ambient conditions such as atmosphere, ground surface and subsurface(Lee et al.2004; Atsuyuki et al.2012)

The standard apparatus for experimental studies of radon is known as a radon chamber, which is mainly used to provide a continuous, stable, adjustable environment of radon concentration(Paula et al.2000). However, it is impossible for the radon concentration in a radon chamber to reach absolute stability, while it can only remain stable within a given relative error range, namely dynamic stabilization. Therefore, the dynamic stabilization technology of radon concentration in a radon chamber becomes the core technology of radon chamber research.

2 Mathematical Model of Radon Concentration in the Closed Radon Chamber

The dynamic stabilization technology of radon concentration in a radon chamber falls broadly into two types: closed control and gas-flow control, of which the latter controls the radon concentration in the radon chamber by controlling the activity of ingoing radon, and the ratio of

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