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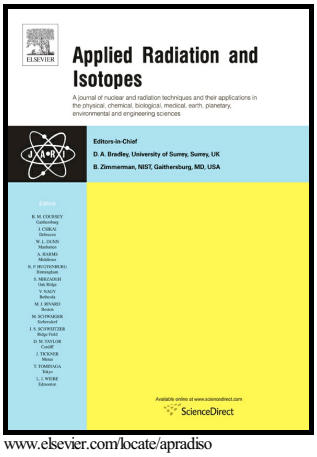

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Study of Radon and Thoron exhalation from soil samples of different grain sizes.

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Abstract

The exhalation of radon (^{222}Rn) and thoron (^{220}Rn) from a porous matrix depends on the emanation of them from the grains by the recoil effect. The emanation factor is a quantitative estimate of the emanation phenomenon. The present study is to investigate the effect of grain size of the soil matrix on the emanation factor. Soil samples from three different locations were fractionated into different grain size categories ranging from <0.1 to 2mm. The emanation factors of each of the grain size range were estimated by measuring the mass exhalation rates of radon and thoron and the activity concentrations of ^{226}Ra and ^{232}Th. The emanation factor was found to increase with decrease in grain size. This effect was made evident by keeping the parent radium concentration constant for all grain size fractions. The governing factor is the specific surface area of the soil samples which increases with decrease in grain size

Key words: Radon, thoron, exhalation, emanation, emanation factor, grain size.

1.0 Introduction

The earth's crust and most common building materials contain trace amounts of ^{238}U and ^{232}Th which decay to radon ^{222}Rn and thoron ^{220}Rn, respectively. The radon gas molecules diffuse out of the ground through pore spaces in rocks and soils and mix with the atmosphere. Inhalation of radon and its daughters can cause a significant health hazard when they are present in enhanced levels in enclosed indoor environments such as human dwellings if they are poorly ventilated. It has been observed that radon is the second most important cause of lung cancer, after smoking [1]. Epidemiological studies have provided convincing evidence of an association between indoor radon exposure and lung cancer, even at relatively low radon levels commonly found in residential buildings [2]. Radon exhalation from inside the room surfaces and infiltration of Radon from external atmosphere coupled with air exchange rate inside a room govern the concentration of Radon inside a dwelling. The indoor radon levels is largely dictated by its concentration in soil gas in the surroundings. The primary mechanism for indoor radon entry is by convective flow through cracks and gaps in the basement. Based on studies evolving the models for radon entry and experimental observations , it is now understood that the predominant source for indoor radon concentration is soil.[3,4].This poses the problem of quantifying the radon potential of any given soil