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Radon exhalation and natural radiation exposure in low ventilated rooms

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Abstract

In the first part of this paper, the influence of radon (Rn-222) exhalation rate from walls and air exchange upon its concentration in room air was considered using a simple mathematical room model. The exhalation rates have been determined in ten low ventilated rooms of ten villas in Jeddah city (Western Province) of Saudi Arabia. An electroprecipitation method has been applied for the determination of the Rn-222 gas concentration in these rooms. The mean Rn-222 gas concentration was found to be 46.80 +/- 8.80 Bq m(-3). The mean Rn-222 exhalation rate was estimated to be 20.11 +/- 6.90 Bq m(-2) h(-1). The mean inhalation dose due to the exposure to Rn-222 gas was calculated to be 1.18 +/- 2.30 mSv y(-1).

The second part of this paper deals with a study of natural radionuclide contents of samples collected from the building materials of these rooms under investigations in part one. Analyses were performed in Marinelli beakers with a gamma spectroscopy system to quantify radioactivity concentrations. The collected samples revealed the presence of the uranium-radium (Ra-226) and thorium (Th-232) radioisotopes as well as K-40. The mean activity concentration of Ra-226, Th-232 and K-40 was determined to be 48.30 +/- 5.08, 43.90 +/- 5.63 and 223.90 +/- 7.55 Bq kg(-1), respectively. These activities amount to a radium equivalent (Ra-eq) of 125.96 +/- 15.90 Bq kg(-1) and to a mean value of external hazard index (H-ex) of 0.34 +/- 0.04. (C) 2012 Elsevier Ltd. All rights reserved.

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