

Radon Exhalation and Natural Radioactivity Levels of Raw Materials Used Building Industry in Basra Governorate in Iraq

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ABSTRACT

Building materials are one of the potential source of indoor radioactivity because of the naturally occurring radionuclides in them, therefore determined the levels of natural radioactivity and radon exhalation rate from these materials is very important. This work presents measurements, comprehensive and analyses study of natural radioactivity in building materials. For this purpose, 14 types of building material, i.e., brick, cement, gypsum, sand, gravel and brick were, used in building Basra Governorate in Iraq. Radon and its exhalation rate were, measured by using "sealed can technique" using CR-39 nuclear track detector. The activity concentrations radionuclides, ²²⁶Ra, ²³²Th and ⁴⁰K was measured using gamma spectroscopy with NaI(Tl) detector. According to the results of this investigation, brick samples had maximum values of the mean radon contribution concentration and ²²⁶Ra concentrations, 279 Bq/m³ and 9 Bq/kg, respectively. All activity concentrations radionuclides, ²²⁶Ra, ²³²Th and ⁴⁰K in raw materials (single), are low comparable with UNSCEAR estimation. For group of raw materials included in construction, became high activity concentration.

Keywords: Raw materials, Radon exhalation rate, Radioactivity concentration, CR-39 detector, Gamma ray spectroscopy NaI(Tl)

INTRODUCTION

All building materials are mostly composed of rock and soil and these two raw material contain natural radioactivity isotopes such as ²³²Th and ²³⁸U decay series and ⁴⁰K [1]. Determination of population exposure to radiation from building material is great importance, since people spend about 80% of their life inside the buildings. The activity concentration of natural radionuclides in building material has been estimated in different countries and regions of the world such as Iraq [2-5], Syrian [6], Kuwait [7], Egypt [8-11], Australia [12], Bangladesh [13], Pakistan [14,15], Eastern Europe [16], China [17] and Cyprus [18]. ²²⁶Ra is the most important radionuclide in the ²³⁸U decay chain from radiobiological viewpoint, therefor, the measurements of ²²⁶Ra concentration in building materials considered as reference in all investigations. Natural radionuclides in building materials may cause both external exposure caused by their direct gamma radiation and internal exposure from radon gas [1].

The radiation which people are exposed to my increase if they live in houses or building constructed by using materials whose radiation doses are above normal background level in the area [19].

The concentrations of natural radionuclides in rocks have been found to depend on the local geological conditions and as such they vary from one place to another. Construction materials can, however, cause substantial radiation exposure if they contain elevated levels of naturally occurring radionuclides. Radiation practice comprises the production, trade in or handling of materials with elevated natural radioactivity causing significant excess exposure of workers or public. Natural rocks such as granite, limestone, marble and so on are widely used in building industry; therefore, it is important to measure the concentration of radionuclides in rocks that are used and those that have the potential of being used as building materials in order to assess the radiological risk to human health [20].