

NATURAL RADON EXHALATION RATE FROM FERTILIZER USED IN BASRA GOVERNORATE/IRAQ

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ABSTRACT

A passive method to measure the radon activity concentration in fertilizer samples, by the Solid State Nuclear Track Detectors (SSNTDs) of type CR39 has been used in the present work, also radon exhalation rate and effective radium content. The RAD7 radon detector has also been used as an active method for measuring the radon activity concentrations and comparing it with the CR39 results. The results reveal that the highest radon concentration, area exhalation rate, mass exhalation rate and effective radium content of 1197 ± 97 Bq/m³, 2408 mBq/m².h, 51.22 mBq/Kg.h and 6.782 Bq/kg respectively, were found in Humi- plan fertilizer; while the lowest values of these parameters were found to be 13 ± 4 Bq/m³, 26.8 mBq/m².h, 0.34 mBq/kg. h and 0.046 Bq/kg respectively in potassium sulphate fertilizer. It is concluded that the radon exhalation rate from the fertilizers do not significantly contribute to the natural environmental radioactivity.

KEYWORDS: Fertilizers Samples, RAD7, SSNTDs, Radon, Exhalation Rates, Effective Radium

INTRODUCTION

The fertilizer play a prime role in agriculture and raw material used in production of some fertilizers is phosphate ore containing various amounts of natural radioactive elements like ²²⁶Ra. Most of the phosphate fertilizers are considered as waste and is stockpiled or discharged into the environment [1]. The effect of Phosphate disposal into environment is the possible increases in radio- nuclides in soils or in groundwater and consequential ingestion by humans through exposure routes such as drinking water and food chain [2]. The natural radioactivity in fertilizer may vary considerably from one type to another depending on the chemical structure of fertilizer and normally fertilizers used for agriculture in Iraqi planet are rich in phosphate ores [3]. The phosphate ores, specially the sedimentary ores, specially the disposal ores, can be significantly enriched with naturally uranium (²³⁵U, ²³⁸U) and their daughters [4]. There is a direct relationship between uranium and P₂O₅ content in the fertilizer and then several studies have been noted that the concentration of uranium follows the concentration of P₂O₅ in various fertilizers [5-6]. In NPK fertilizer, potassium component augment the natural radioactivity because of the presence of radioactive ⁴⁰K, whose natural abundance in potassium ore is 0.0018%. Since the starting materials of the fertilizers is phosphate rock used in wet process by attack of sulphuric acid in fertilizer industry contain varying amount of uranium. The ²³⁸U remains concentrated into phosphoric acid while ²²⁶Ra, ²¹⁰Po, ²³²Th and ²¹⁰Pb precipitated out as sulphate salt concentrated in phosphogypsum as the byproduct. The uranium either in form of [U(SO₄)₂] or [UO₂(SO₄)] in phosphoric acid is water soluble, remains in phosphoric acid which is used for the fertilizers production, thus the uranium content of fertilizers is expected to be high [7-9]. The environmental impact of fertilizer production depends on the raw materials, production processes and the status of the pollution control equipment. In addition, fertilizer plants cause environmental harm through emissions of process specific chemicals into the air,