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Measuring the concentration of radon in the air of homes spend Hindi - the city of Karbala

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KEYWORDS

Radon, CR-39, Homes, Water, Building materials

A B S T R A C T

I've been measuring the concentration of radon in the air of homes spend Hindi - the city of Karbala and using reagents solid-state tracks nuclear (TASTRAK) and known commercially as CR – 39. Where, it was taking four different homes in the area, as well as a different place, where they were taking the two houses on the outskirts of the city (rural), one in rustic place for the unity and the other in a rustic place with a group houses, and the houses of others have been taken into the city center, one in residential neighborhoods and the other between a group of commercial premises, and taking every home five models of radon negative – the first in the yard of the house, in the kitchen and the second and third in the bedroom and living room, the fourth and fifth within the health workers have been sampled after a period of time of seven months. After that has been taken, these models were treated chemically using sodium hydroxide solution and with the temperature 75°C for a period of one hour and then washed with distilled water and dried. Optical microscope with high accuracy was used to calculate the effects formed per unit area and then to calculate the concentration of radon in the above areas. By the results found that the concentration of radon varies from 240.7 Bq/m3 (in health workers home within the city and between the shops) to 82.3 Bq/m3 (in health workers home on the outskirts of the rural unit). The rest of the houses and the rest of the places they were taken for every home was between the two results above, it was clear that health workers in the city and among the shops to be more focused for radon gas because of the lack of ventilation in those areas.

Introduction

Human exposure to radiation permanently from two main sources – natural sources and man-made sources for multiple purposes constitutes human exposure to natural sources of the core portion of the exposure, such as cosmic rays (Cosmic Rays) and the radiation emitted from radioactive elements naturally. Each material surrounding us almost contains a small percentage of radioactive materials (Bahauddin Hussein, 1989) and this makes human being to a low level of background radiation exposure. Radiation effects in the environment may remain an impact for many years to affect the genetic makeup of humans and animals leads to genetic abnormalities which shows its impact on subsequent generations and the impact of this pollution reaches up to water, soil and enters the food chain to humans and animals alike (Abdul Karim, 2002).

The radioactivity of natural radioactive background Uma knows very important. For the population's exposure to radiation are characterized based on nuclei with atomic number. Of which, the most (82) radioactivity is due to an increase in the number of protons in the nucleus, which makes a large electrostatic repulsion forces. Radionuclides can be divided into three series – uranium and alaktnyum and thorium, which represents most of the potions Foreign caused by background radiation (External Background Radiation Dose) radioactivity which exposed his rights as established doses received from external sources of ionizing radiation from cosmic rays or divorced gamma rays in the earth's crust as much as the equivalent of the effective dose in humans (Abdul Karim, 2002; Nada Fadel Tawfik, 1996).

Radon

Radon is a colorless, tasteless, odorless and spreads from the soil to the atmosphere - mediated proliferation of molecules, a natural origin caused by the disintegration of radium radioactive. And Hoahd elements of the periodic table and Hogaz noble and radiant an atomic number (86) and is found in nature in a gaseous It is one of the heavier gases known in the nature of this gas was discovered in (1900) by the researcher (Dorn) in radium salts (Ghassan Abdullah Ali, 1999; Amarabd Rahman Saad, 1999) exists radon naturally almost everywhere Caladium widespread in the earth's crust

Physical and chemical properties of radon

Belongs to the noble gas radon or radon atom just like any other inert rare gases rarely react to it can be spread freely across all materials Alfonzo gases because they are chemically inert . Radon gas is colorless and odorless and cannot be detected human senses, so it depends on detection mainly to detect radiation associated with the breakup and disintegration and Edith. It is worth mentioning that the average radon decay in water and some other liquids (Bahauddin Hussein, 1989)

Sources of radon

The primary sources of radon are the soil, water and building materials:

1- Soil and rock

Approximately 80% of the radon emanating outside to the center produces the top layer of the Earth, of course, and the presence of radium -226 -238 uranium and thus is the reason why the issuance of radon in the soil. Vary the amount of radium and uranium from one place to another according to the geological nature. In general, the rocks in the earth's crust contains about (1) picocuries in grams and the soil around (0.7) picocuries grams (Knoll, 1979).

Each of the disintegration of radium atom present in the soil or rock grains will give an atom of radon. If corn production this close to the soil surface, thus it can escape into the middle to the outside. The amount of the issuance of radon from the soil depends on several factors, including permeability and soil moisture, are shown in Figure 1. Mechanical emanation of radon into the middle to the outside, studies have calculated that about 10% of the radon generated in a meter closer to the surface of the soil begins to center the outside (Keneth and John, 1987).

2- Water

The average radon solubility in water, and increasingly Anhalalith decrease the water temperature. So when groundwater is going through cold rock underground soil absorbs a good amount of radon gas. When water is heated or stir the large amount of radon instincts and proceed to the outside center. Rely mainly the amount of radon in the water when it is used on two factors, first is the local geological specifications where water is extracted, and the second source of water used. It was found that radon caused by water is a problem in buildings that use well water directly, while not be a problem in homes that rely on the public water network. This is because it is usually keeping the public water network for processing and then storage and later distribution time unraveling the radon and outputs disintegration dissolved in the water before it reaches the building. Estimated that the concentration of 10,000 picocuries per liter of radon in water will add about 1 Picot Korean liters (37 Bq/m3) in the indoor air of homes, assuming normal use of the water. It has been found that the average level of radon in well water ranges between (500 and 170000) picocuries per liter. It is worth mentioning that the radiation dose that can be received by an individual from drinking water containing radon as a result of inhalation of radon and outputs the largest liberal dose of the stomach caused by ingestion of 3 to 10 times. Participates oceans around (1 %) of the amount of radon released to the center despite the fact that the outer area constitutes twice the size of Earth, is due to the fact that the content of sea water of uranium and radium are much smaller than the content of the soil and rocks (Bahauddin Hussein, 1989; Keneth and John, 1987; Qusay Rashid Saeed, 1989).

3- Construction materials

Containing building materials from soil and rock (such as cement, block, ceramic, etc.) the radioactive material of natural origin such as uranium, radium and radon are therefore generate . Permeability of these materials is sufficient to set off the radon generated including the outside to the center. Shows (Figure 2) places the main radon enters them into buildings. And generally depend radon concentration inside the buildings on the habits and behavior of living and methods of ventilation (Knoll, 1979). There are also other factors that affect the concentration of radon in buildings such as humidity and temperature. Where temperature plays an important role, because it is usually the temperature inside the building is higher than outside, and this generates little difference in pressure. Which leads to the suction air soil under the house to the inside, which in turn can raise the concentration of radon in the home. And it was found that the concentration of radon in homes vary from season to season, and from month to month and from day to day until between day and night (Knoll, 1979; Berlin *et al.*, 1989; HHS, 1997).

Radioactive radon gas

Consists of three isotopes are

1- Radon is a peer (Rn^{222}) and belongs to the series (U238) This is the match the longest lived of the isotopes of radon as a half-life (3.825) days and this age gives him the ability to spread the limited spaces in the atmosphere which is emitter of alpha particles card (5.4 Mev).

2- Thoron a peer (Rn 220) and belongs to the series (Th232) has a half-life (55) seconds to almost a gross alpha emitter card (6.2 Mev).

3- aktnaon a peer (Rn 219) and belongs to the series (Ac 235) has a half-life of four seconds, and there are very few because of the lack of availability (235U) and also because of the short half-life (Hursh and Spoor, 1973; Ghassan Abdullah Ali, 1999).

As the radon element invader and belongs to the group of the noble gases, therefore, his ability to move in the air from one place to another without any obstruction, which makes the process of exposure and its rays occur with high probability for by large numbers of people, confirms a United Nations report (UNSCEAR, 1983) about the radiation sources natural that radon represents more than 50% of the total is subjected to human radiation dose resulting from natural radiation of radon (Hursh and Spoor, 1973) .

That exposure to radon gas is one of the serious health problems has been proven relationship between exposure to Bathat alpha particles with the incidence of disease cancer Lung as that when the process of inspiration and enter the air saturated with this gas to the human lung, a large proportion of it is deposited on the walls and the lining of the respiratory system and this leads to the absorption of doses of it brokered the bronchi, and statistics and estimates made in this regard and found that all (200) deaths occur per year per 105 inhabitants when exposed only to read the background of radon and Oledath (Berlin *et al.*, 1989; Hursh and Spoor, 1973; Archer *et al.*, 1973)

Solid State Nuclear Track Detectors (SSNTDS)

Know reagents impact nuclear solid state as substances that have the ability to configure the effect of damage as a result of the passage of charged particles heavy which can show the effects of these particles process skimming chemotherapy and observed under a microscope (Holaday, 1969). Considered paths damage traces on the type of serious incident and energy As for metals Omoad semiconducting shall be less than the resistivity (2 × 105 Ohm.cm) it cannot keep the paths of radiation damage to the abundance of electrons (Fleischer *et al.*, 1965). Classified nuclear detectors impact solid state to :

A - Non-organic reagents (Inorganic Detectors): They reagents that are not included in the installation of its article element carbon and hydrogen atoms are the links between the ionic fractions such as glassware, silicates, halides corona (Hepburn and Windle, 1980).

B - organic reagents (Organic Detectors): They reagents which enters the element carbon and hydrogen in the composition of its article such as plastics (plastic material) of all kinds (Allexan, Almacrawfol) and cellulose nitrate types (CN-85, CA-80-15, LR-115) The detector (CR-39) and (PM-355), (Durrani and Bull, 1980) are more sensitive to organic reagents from non-organic reagents are shown in Table 1 types of reagents and compositional format and types of charged particles and energy (Fleischer *et al.*, 1975).

Impact of nuclear detector (CR-39)

Discovered Detector (CR-39) in (1978) by researchers (Cartwright and Shirk), which is the installation of Hydrocarbon (C12 H12

O7) n. The proportion of hydrogen in which (6.6%) (Hepburn and Windle, 1980), and is known commercially detector (CR-39) and consists VCM this reagent of the two groups allele (CH2 = CH-CH2-), Figure 3 show the Chemical composition.

Can VCM (CR-39) that Athblmr and correlated cross-sectional to polymers homogeneous (Homopolymers) Aomcharkh and enjoy detector (CR-39) Bhsasih high radiation so entered in the precipitant areas that include recording the effects of protons Aogesemat Alpha Aoshzaaa fission (Fission Fragments) The reason for the sensitivity Detector to the existence of the weak carbon bonds break easily when exposed to radiation, and the detector is characterized as follows (Hepburn and Windle, 1980; Cartwright and Shirk, 1978; Khan, 1973)

1-Optically transparent and non- light-sensitive.
2- With a high sensitivity to radiation is sensitive to alpha particles and protons and neutrons.
3-homogeneous and symmetrical
4- is not affected by beta particles Awahah Kama Aoachah rays
Does not dissolve in solution skimmer where these solutions work to remove layers from the surface of the detector.

Experimental

I've been processing (20) forms a model of solid-state detectors (39 - CR) was distributed in four homes where they were taking the two houses in the countryside, one in a rural place alone and the other with group homes in the countryside. The two houses of others Vkana in the city, one in a residential neighborhood and the other between a group of commercial premises and was distributed models in every home in the form of five models distributed as follows (Square House, kitchen, bedroom, living room, within the health workers), where these reagents ready Company English was the dimensions of the detector cm (2 * 2) were teaching each model (detector) number of its own and then installed each detector in the middle of the plastic enclosure and then been covered plastic enclosure crimp cap plastic to keep them from impurities and dust so that do not pertain to the detector and Figure 4 illustrates the enclosure with plastic detector.

After that, the distribution of models in places experience a period of seven months starting from the month of February until the end of August so that we can take what could be more of weather conditions. After the end of the specified time period has been collecting models and chemical treatment with a solution of sodium hydroxide (NaOH) and a concentration of 6.5 mg / ml and a temperature of $ 75 C ◦ for a period of one hour and was then wash models with distilled water to get rid of the remnants of various drilling on the surface of the reagents and then dried and then calculated the number of tracks per unit area by using the optical microscope where the tracks were counted manually and then calculated the average number of tracks per unit area visible on each detector and knowing the power of each space unforeseen enlarge calculate the average number of tracks per unit area of the reagents.
To find the radon concentration (C) unit ((Bq/m3 in all models using the following relationship:-

$$C = \frac{Co\ s}{t}$$

Co concentration of radon gas in the chamber calibration.

t time period in which the reagents were exposed to radon gas in places of study.

Table 1: S illustrates the concentration of radon in the places of the study:-

Result and Discussion

And by the results found that the concentration of radon varies from 240.7 Bq/m3 in (home health workers within the city and between the shops) to 82.3 Bq/m3 in (health workers home on the outskirts of the rural unit) The rest of the houses and the rest of the places they are taken for every home between the two results above, it is clear that health workers in the city and among the shops to be more focused and radon gas because of the lack of ventilation in those areas.

Conclusions

By the results that have been obtained and are described in Table 1 is clear that it is important to be continuously ventilated homes and stay away from crowded areas and preferred accommodation in the houses are isolated from each other.

Table.1 The concentration of radon in the study places

Number of samples	Place of measurement	Radon concentration Bq/m^3	
1	Garden	32.8	
2	Kitchen	54.4	
3	Bedroom	60.1	Farmhouse alone
4	Parlor	56.5	
5	Health workers	82.3	
6	Garden	37.5	
7	Kitchen	59.3	
8	Bedroom	68.5	Farmhouse with group
9	Parlor	60.3	
10	Health workers	88.6	
11	Garden	58.3	
12	Kitchen	120.8	
13	Bedroom	154.1	House in a residential neighborhood within the city
14	Parlor	138.2	
15	Health workers	208.7	
16	Garden	62.1	
17	Kitchen	130.2	
18	Bedroom	167.3	House in the city with a collection of shops
19	Parlor	150.1	
20	Health workers	240.7	

Figure.1 Mechanical emanation of radon into the middle to the outside

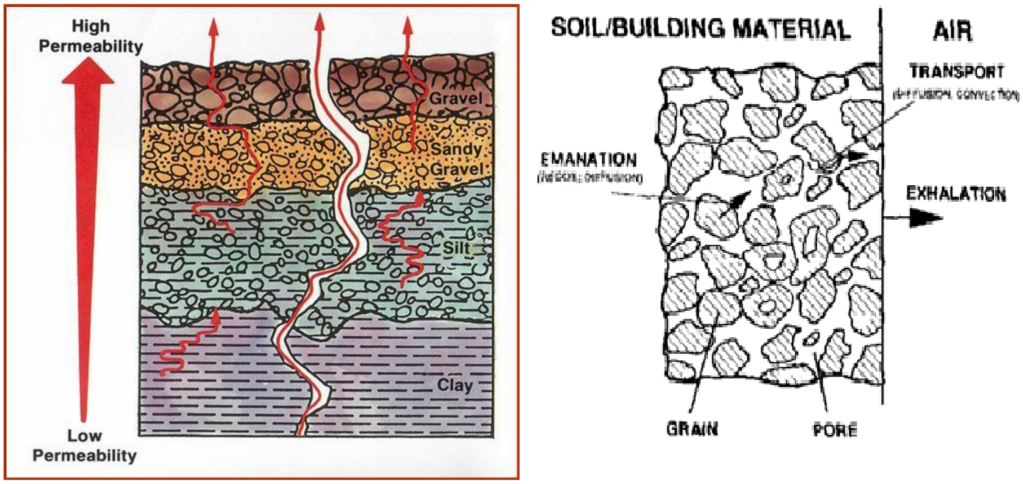


Figure.2 The locations of radon entry into homes

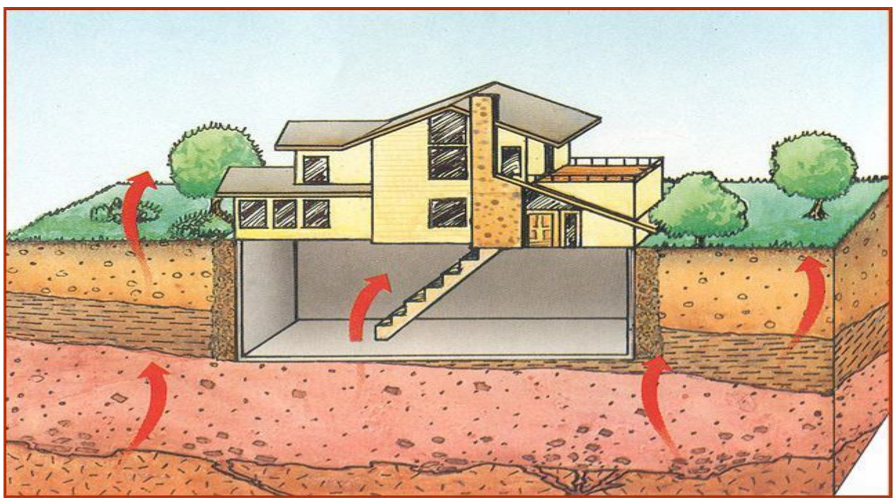


Figure.3 The chemical composition

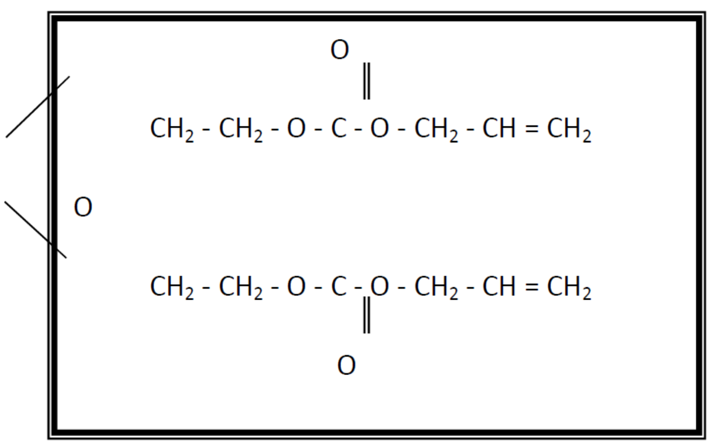
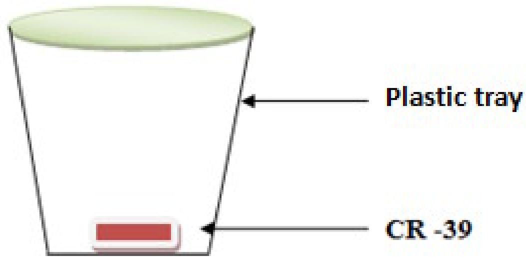


Figure.4 Illustrates the enclosure with plastic detector



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