

SYNOPSIS

Over the last several decades, there has been an increasing interest in the measurement of the indoor radon concentration levels and natural radioactivity through out the world. One of the main reasons behind this increasing interest may be the fact that both indoor radon and natural radioactivity may cause cancer. Another reason behind it may be the widespread use of radon as an environmental tracer because radon is both a friend and a foe. The possibilities of transport of ^{222}Rn within the earth, its waters, and atmosphere make it a useful tracer for a remarkable variety of geophysical e.g. exploration of uranium deposits, hydrological, and atmospheric purposes. Therefore, measurement of indoor radon and natural radioactivity play a critical role in monitoring human health and safety. Besides the above studies, there is always demand to either develop a nuclear track detector which is more efficient than CR-39 detector or to discover new efficient etchants. The prime objective of the present work was to study the above-mentioned subjects.

Chapter 1 gives an overview of radon wherein the topics related to the origin of radon, its sources and transport mechanism are described. A brief description of radon dosimetry and its measurement techniques have also been included in this chapter. In Chapter 2, the subject of Solid State Nuclear Track Detectors is briefly described that include Introduction to Track Detectors, Criteria for Track Detection, Track Etching: Methodology and Geometry, etc. Chapter 3 covers my novel achievements concerning the discovery of new etchants, namely, NaOH/1-propanol, NaOH/ethanol, NaOH/Methanol and NaOH + Methanol + water (SMW solution).

Indoor radon concentration levels and natural radioactivity in soil were measured in some major cities of the Bahawalpur Division. The results obtained from this study have been discussed in Chapter 4. From the observed data of the natural radioactivity and indoor radon levels, annual effective dose and excess lung cancer risk have been calculated.

Chapter 5 deals with mathematical model wherein the idea of back diffusion has been incorporated for a closed system. This model is used to determine the radon exhalation rate. Using this model, radon exhalation rate has been calculated from soil and sand samples that were collected from different areas of Pakistan.

Data concerning the determination of ^{238}U contents in ore samples using CR-39 based Radon Dosimetry have been presented in Chapter 6. Here, CR-39 based NRPB dosimeter; Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES) and HPGe based gamma spectrometry were used to measure ^{238}U contents in ore samples.

Finally, Chapter 7 presents conclusions, suggestions, as well as a general discussion of the main results.