Environmental Radiological Study in um Bogma Formation of AL-Ramsy Mines, East Abu-Zeneima area – Southwestern Sinai, Egypt.

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Rania Mohamed Samy
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SUMMARY

SUMMERY

The Um Bogma formation represents the main target of this study where most of uranium occurrences are incorporated in its sediments. It conformably underlies the El Hashash formation and unconformably overlies the Adadia formation. The Um Bogma formation was introduced in (1969) in using the name Um Bogma formation, for the Carboniferous carbonate rocks, considering the Um Bogma area as its type locality. It is about 40 m at the type locality.

There is a lack of informations about the mineral composition and the accompanied radioactivity levels in Al- Ramsy mine. These informations are essential to create a scientific database of the elemental and radiological base – line level.

The elemental analysis has been undertaken by means of the atomic absorption technique using GBC 932 AA (UK) spectrometer. The observed major elements are Fe, Cu and Mn, which are strategic elements. The radon progeny concentration is measured by active techniques using (EDA RDA 200) and roll method. The radioactivity concentrations of mine rocks samples have been identified using gamma ray spectroscopy techniques. The observed radionuclides are the naturally occurring radioactive members of uranium and thorium decay series along with the radionuclide ^{40}K. The radiation health hazard due to natural radionuclides in the mine ore were calculated. In the field, the measurement of natural radioactivity in rocks is carried out by the detection of gamma radiation for determination of the

higher concentration of the radioelements in the rocks inside the mine, by using Czech made Gamma-ray Spectrometer, GS-512.

In general, the radon progeny concentration inside the mine is lower than the limit for workers but all the locations at distance greater than 200 m expected to have higher concentration of radon progeny than the international limit. The radioactivity concentration of the mine rocks is to great extent higher than and/or comparable with the world averages except the activity concentration of ^{40}K was lower than the world average. The variation in the average activity ratio ($^{226}Ra/^{238}U$ and $^{210}Pb/^{238}U$) could be due to the presence of varying degrees of disequilibrium between the members of ^{238}U decay series as a result of Ra leaching.

From the results, it is found that low concentrations of equivalent U are at distance 60 m and while high concentrations are at distance 150 m. Low concentrations of equivalent Th at distance 60 m and 200 m but, high concentrations are at distance 75 m. The lower concentrations of K are at distance 20 m and 220 m and high concentrations are at distance 40 m and 215 m inside the mine.

These radiation hazards indices indicate that the region under study (mine glary) possess higher values than the internationally limits in particular at distance $X > 200$ m accordingly, our data may help in constructing a database for the proposing the suitable solution to exploit and explore that mine for the sake of the country development in the industrial domain.

INTRODUCTION

INTRODUCTION AND AIM OF THE WORK

The disintegration of natural radioactive elements is accompanied by the emission of the three radioactive decay types: alpha particles (α), beta particles (β) and electromagnetic radiation. The latter is generally referred to as gamma (γ) radiation when emitted by the nucleus, and X-radiation when originating from the electrons orbiting the nucleus. Gamma rays, in contrast to alpha and beta particles, have no mass or charge and therefore, form the most penetrating radiation. The rays are not affected by electric or magnetic fields, but travel at the speed of light and eject photoelectrons from certain materials.

All common rock types and the soils derived from them contain a significant amount of the naturally radioactive elements that emit gamma radiation. The three naturally occurring radioelements are potassium, uranium and thorium. The K has a simple form of the radioactive decay. Only one 40K of the several natural isotopes of K is radioactive. No significant fraction of K isotopes takes place in nature and so the radioactivity of potassium is constant under all conditions. ^{40}K, constitutes 0.012 % of the total K and characterized by single gamma energy of 1.46 MeV. The decay is said to be mono-energetic. Uranium consists principally of two isotopes; ^{238}U and ^{235}U, of which the first is the most abundant and is the only one of the concern under field survey conditions. The radioactive decay of ^{238}U is complex and passes through 14 steps, each with characteristic disintegration and daughter products before it reaches the final stable end product ^{206}Pb. The principle gamma emission of U is associated with ^{214}Bi. ^{232}Th is the principle isotope of natural thorium and like ^{238}U has a complex decay process before reaching ^{208}Pb. The strongest gamma emitter in the Th decay series is the ^{208}Ti. Several other sources of gamma can also be detected in the field like cosmic radiation and radioactive gases such as radon and its progeny.

The field measurement of natural radioactivity in rocks is predominantly carried out by the detection of gamma radiation. In a