



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

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Thesis

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TABLE OF CONTENTS

	Title	Page
	ACKNOWLEDGEMENT	i
	TABLE OF CONTENTS	iii
	LIST OF TABLES	
	LIST OF FIGURS	Viii
	SUMMERY	ix
	 INTRODUCTION AND AIM OF THE WORK	 1
	 CHAPTER 1: SOURCES OF RADIOACTIVITY	
1-1	Natural Sources	5
	1-1-1 Cosmic rays	5
	1-1-2 Terrestrial radiations	8
	1-1-3 Radon	12
1-2	Man–Made Sources	13
	 CHAPTER 2: GEOLOGICAL AND THEORITICAL ASPECTS	
2-1	Geological And Structural Setting	16
	2-1-1 Paleozoic rocks	16
	A. Cambro-ordovician rocks	16
	A.1. Sarabit EI-Khadim formation	17
	A.2. Abu Hamata formation	17
	A.3. Adadia formation	17
	B. Lower Carboniferous rocks	17
	B.1. Um Bogma formation	18
	B.1.a. Lower siltstone, dolostone and claystone member	18
	B.1.b. Middle marl, dolostone member	18
	B.1.c.Upper dolostone ,siltstone,claystone member	19
	B.2. El Hashash formation	19
	B.3. Magharet El Maiah formation	19
	B.4. Abu Zarab formation	19

	2-1-2 Mesozoic rocks	20
	2-1-3 Quaternary rocks	20
2-2	Gamma Ray Properties	20
	2-2-1 The interaction of gamma with matter	20
	A. Photoelectric effect	21
	B. Compton scattering	21
	C. Pair production	22
	2-2-2 Interactions of gamma radiation with detector crystal	22
2-3	The Basic Quantities And Units Of Importance In Radiation Measurements	25
	2-3-1 Exposure	25
	2-3-2 Dose rate	25
	2-3-3 Radiation absorbed dose	25
	2-3-4 Dose equivalent	26
	2-3-5 Effective dose equivalent	27
	2-3-6 Flux	29
2-4	Radon And Radon Daughters	29
	2-4-1 Chemical and physical properties of radon	30
	2-4-2 Factors affecting on the radon in underground mines	32
	A. Uranium mines	34
	B. Non-Uranium Mines	34

CHAPTER 3: BIOLOGICAL EFFECTS OF RADIATION

3-1	Basic Human Physiology	35
3-2	Cell Biology	35
3-3	Sequential Pattern Of Biological Effects	36
	3-3-1 Latent period	36
	3-3-2 Period of demonstrable effects on cells and tissues	37
	3-3-3 Recovery period	37
3-4	The Interaction Of The Radiation With Cells	37
3-5	Radon And Its Hazards	39
3-6	The Somatic And Hereditary Effects Of Radiation	40
3-7	The System Of Dose Limitation.	41

	3-7-1 The role of the ICRP	41
3-8	The External and Internal Exposure	42

CHAPTER 4: EXPERIMENTAL TECHNIQUE AND MEASUREMENTS

4-1	Determination of Some Trace Elements	45
4-2	Radon Measurements	45
	4-2-1 Air sampling and filtering	45
	4-2-2 Pump calibration	46
	4-2-3 Alpha counting instrument	47
	4-2-4 Calibration for detector efficiency	48
	4-2-5 Background	48
	4-2-6 Self absorption of the filter	49
	4-2-7 Procedure for potential alpha energy concentration Roll-method(WL).	49
	4-2-8 Calculations of the individual WL	49
	4-2-9 Theory of calculations	51
4-3	Radioactivity Measurements	51
	4-3-1 Gamma-ray spectrometer	51
	A. Preamplifiers	51
	B. High voltage power supply	52
	C. Amplifier	52
	D. Multichannel analyzer (MCA)	53
	E. The detector	54
	4-3-2 Detector efficiency	55
	4-3-3 Detector resolution	56
	4-3-4 Set up of the used gamma ray Spectrometer:	57
	4-3-5 Experimental procedures	58
	4-3-6 Sample preparation	59
4-4	The Field Measurement of Natural Radioactivity	60
	4-4-1 GS 512 spectrometer	60

CHAPTER 5: RESULTS AND DISCUSSION

5-1	The Trace Element Analysis	62
5-2	Radon Progeny Measurements	62
5-3	The Radioactivity Concentrations in Ore Samples	65
5-4	Hazard Parameters	69
	A. Calculation of the absorbed dose rate	70

	B. Assessment of occupational doses	70
	C. Internal annual effective dose	71
	D. Radium equivalent activity	71
	E. The external hazard index (H_{ex})	72
	F. The internal hazard index (H_{in})	72
	G. The representative level index ($I_{\gamma r}$)	72
5-5	The Filed Measurements Using GS 512 Spectrometer	74
	CONCLUSION	77
	REFERENCES	80
	ACCEPTED ARTICLE	
	ARABIC SUMMARY	

LIST OF FIGURES

Title		page
Fig.(1-1)	Location map of Al Ramsy mines, Southwestern, Sinai, Egypt.	2
Fig.(1-2)	Radioactive mineralization (Uranium sediments) distributed around the study area	4
Fig.(1-3)	Major pathways of primordial radionuclides and important progeny in terrestrial ecosystem. Symbols: K- potassium isotopes, Uranium Isotopes, Th - thorium isotopes, Ra - radium Isotopes, Rn - radon isotopes or progeny of radon decay.	12
Fig.(2-1)	Photoelectric effect	21
Fig.(2-2)	The Compton scattering	22
Fig.(2-3)	The pair production	22
Fig.(2-4)	Compton, photoelectric and pair production cross section of Ge for high energy γ -ray	24
Fig.(4-1)	Air sampling pump with filter paper holder	46
Fig.(4-2)	EDA instrument with its scintillator tray and filter discs.	48
Fig.(4-3)	Absolute efficiency curve for germanium detector	57
Fig.(4-4)	Block diagram of the HpGe detector setup	58
Fig.(4-5)	GS-512 spectrometer	61
Fig.(5-1)	Copper mineralization inside the mine	63
Fig.(5-2)	Iron and manganese ore inside the mine	63
Fig.(5-3)	The relation between radon progeny concentration and the depth of the mine.	65
Fig.(5-4)	The activity concentrations of radionuclides in the samples	66
Fig.(5-5)	The total count of radionuclides inside the mine	74
Fig.(5-6)	U concentration in ppm inside the mine	75
Fig.(5-7)	Th concentration in ppm along the mine	75
Fig.(5-8)	K concentrations inside the mine	76

LIST OF TABLES

	Title	page
Table (1-1)	Radionuclides produced from cosmic rays	9
Table (1-2)	Primary decay schemes of U-238	10
Table (1-3)	Primary decay schemes of Th-232.	11
Table (1-4)	Typical average annual doses due to natural radiation	14
Table (1-5)	Average annual doses due to man- made radiation	14
Table (1-6)	Radiation exposed and the associated doses	15
Table (2-1)	Quality factor values for varios radiations	27
Table (2-2)	Tissue weighting factors	28
Table (2-3)	Some physical and chemical properties of radon	31
Table (3-1)	Probability coefficients for stochastic effects	41
Table (3-2)	Occupational annual limit for intake for several radionuclides	43
Table (3-3)	Dose limits per year for work with radioisotopes	43
Table (3-4)	Current Maximum permissible dose (MPD).	44
Table (4-1)	Relative intensities of gamma rays from ²²⁶ Ra with its short-lived gamma-emitting daughters	59
Table (5-1)	The results of atomic absorption spectrometer analysis for selected seven samples	62
Table (5-2)	The radon concentrations of air samples collected inside the mine	64
Table (5-3)	The activity concentrations in Bq/Kg for soil samples collected alongside the mine	67
Table (5-4)	Minimum, maximum and average activity concentration values	68
Table (5-5)	The mean activity concentrations in Bq/Kg of primordial radionuclides for different countries	68
Table (5-6)	The activity concentrations of ²¹⁰ Pb (Bq/Kg) and the activity ratios of Ra/U, Pb/U and Pb/Ra of all samples	69
Table (5-7)	Radium equivalent activity, gamma radiation external and internal hazard, adsorbed dose and the external and internal effective annual dose.	73

SUMMARY

SUMMARY

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 ($^{226}\text{Ra}/^{238}\text{U}$ and $^{210}\text{Pb}/^{238}\text{U}$) 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 ^{40}K 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}Tl . 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