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THE EFFECT OF FIELD STRUCTURES IN CONCENTRATING URANIUM ALONG MICROGRANITIC DYKE AT WADI UM DOWEILLA AREA, SOUTH EASTERN DESERT, EGYPT

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ABSTRACT

The studied dyke is a famous U-bearing microgranite dyke located in Wadi Um Doweila that extends for10.6 km in the northeast direction. The dyke and its surrounding metavolcanics are suffering from a series of sub-parallel faults trending NW. The dyke is mainly of granitic composition characterized by grayish pink color where the potash feldspar is the main feldspar. It is fine-grained rock with obvious porphyritic texture and it is dominated by zircon, apatite, monazite and fluorite as the main accessory minerals beside uranophane as the main uranium mineral.

The geochemistry of the dyke shows that it originated from calc-alkaline magma type, which developed a postorogenic and within plate tectonic setting. The distribution and contents of U, Th and Zr suggest that they are controlled by the fractional crystallization of small amount of accessory minerals due to the incompatible behavior. The study of the metasomatized parts of the dyke indicated that most of the Th and 50% U are found in the accessory minerals. The remainder of U is deposited in the inter-granular spaces and in the newly formed hydrothermal minerals such as *as* sericite and Fe- oxides. Such U accumulations at labile sites probably constitute the potential source of U which leached,- mobilized and redeposited by the convicting hydrothermal *fluids* along the faults and probably led to the formation of the secondary uranophane mineralization in the central and southern parts of the dyke. The uranium concentrations appear to be structurally controlled.

INTRODUCTION

The area of Wadi Um Doweila is located in the southern part of the Eastern Desert between Lat. 22° 21'- 22° 27' N and Long. 33° 21' - 33° 31' E , covering an area about 76 km^2 **(**Fig. 1). The Eastern Desert of Egypt is one of the densest areas of continental dyke swarms on the earth (Vail ,1970). The alkaline magmatism is more dominant in the Southern Eastern desert of Egypt, and occurs as a number of ring complexes, linear dykes and alkaline plugs (El Ramly and Hussein, 1985)

The target of the present study is directed to throw light on the geochemical characteristics of the dyke and to configure the role of the field structures in concentrating uranium in the microgranitic dyke that crops in the east southern corner of the area.

Hashad et al. (1979) stated that the province embraces a wide time span from the lower Paleozoic to Late Cretaceous with peaks

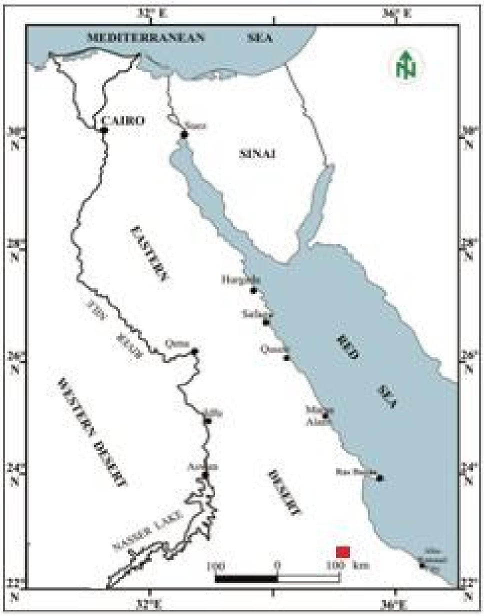


Fig 1: Location map for W. Um Doweila area, South Eastern Desert, Egypt. ■ Study Area

centered tentatively around Siluro-Devonian, Permo-Triassic, Early and Late Cretaceous. Episodic emplacement of alkaline magmatism is common in NE Africa. Over 130 ring complexes and ring dykes were emplaced during the time span between closing of island arc activity at the end of the Pan-African orogeny and opening of the Red Sea (Vail, 1985; Bouden, 1985).

Bjornerud (1989) stated that the Um Doweila bostonite (UDB) represents an excellent example of the new volcanics related to the basement rocks of Egypt. He studied the structure of the area and reported that the NE-SW and NW-SE tensional fractures have been reactivated as strike-slip faults (sinistral and dextral respectively) under N-S (semi-meridional) followed by a ENE-WSW trending regional compression stresses creating zones of ductile deformation characterizing coupling tectonic environment which played an important role in the metamorphism of the country rocks. The metamorphism in the country rocks is of low grade metamorphism that occurred under moderate pressure with depletion in silica and enrichment in CaO and MgO restricted to marble zone.

Abdel-Monem et al. (2003) studied the chemistry of the metavolcanics and suggested that they originated from a calc-alkaline magma, with island arc tectonic setting but the dyke originated from an alkaline to per-alkaline magma and developed Within-plate anorogenic tectonic setting under extension regime.

Ibrahim et al (2005) studied the bostonite of Um Doweila (UDB) and reported that it represents one of the uranium occurrences related to peralkaline volcanics and located to the south of Wadi Allaqi, Egypt. Um Doweila area is characterized by two semi-perpendicular dominant trends (NE-SW and NW-SE) resulting from an extensional phase of deformation prior in age to the bostonite emplacement. The mineralogical study of the UDB samples reveals the presence of uranophane, betauranophane, wolframite (hueberite), monazite, zircon, rutile and opaques whereas pyrite is common in volcanogenic metasediments. The U migrated from the central zones of UDB in close contact to the fault zones (channel-ways) to the peripheries outward and relatively concentrated at the NE and SW upper and lower corner respectively.

METHODS AND MATERIALS

Eleven samples were prepared for petrographic studies. The petrographic studies and photomicrographs were carried out using a Nikon (optiphot) polarizing microscope equipped with a full automatic photomicrographic attachment (Microflex AFX-II).

Eight samples representing the fresh part of the dyke were chemically analyzed for the major oxides and trace elements at the laboratories of the Nuclear Materials Authority.

The major elements were determined on fused pellets prepared according to the method of (Shapiro and Brannock, 1962) using lithium tetraborate as a flux. Some trace elements were determined on pressed powder pellets. All XRF elements were calibrated against recommended values of international standards using the data given by Govindaraju (1984). The significant trace elements were determined by X-ray fluorescence method (Philips-PW 1480 X-ray spectrometer X-unique II with automatic sample changer PW 1510), the Sc, Hf, Ta, Th and U were analyzed using instrumental neutron activation analysis (INAA). Absolute accuracy has been assessed by comparison with international reference materials analyzed along with the samples and is generally less than 2%. Mineralogical investigation of the heavy minerals was carried out as follow: each sample was crushed then sieved into various mesh sizes. The – 60 +150 and –150 +200 mesh size fractions were concentrated using Wulfly Table to remove the light mineral fraction (e. g. feldspars and quartz) then the heavy fraction was dried. The magnetite was separated by hand magnet, while the magnetite-free fraction was concentrated using bromoform (Sp. G. = 2.85). Yielded heavy fraction, passes the Frantz Isodynamic Separator at 8o side tilt and 200 forward slopes and at different current intensities (0.2, 0.5, 1.0 and 1.5 A) in order to separate the heavy minerals according to susceptibilities. This was followed by hand picking under binocular microscope in order to obtain pure mineral separates and investigate these minerals using the Environmental Scanning Electron Microscope (ESEM) technique at laboratories of Nuclear Materials Authority (NMA). [Model Phillips XL 30 with Energy Dispersive X-ray (EDX)]. The radiometric survey were carried out using measurements by a portable gamma-ray spectrometer (model GS 256 and model GS-512 made in Czechoslovakia), with NaI (Tl) detector of 75 × 75 mm2 have done. This instrument also measures eU and eTh in their daughters in parts per millions (ppm) and K (%) in the field.

GEOLOGIC SETTING

Um Doweila area is located in the southern Eastern Desert, south of Wadi Al Allaqi (Fig. 2). It covers an area about 70km^2 occupied by metavolcanics that cut by a number of dykes and overlain by the Nubian sandstone. The dyke crops in the northern part of the area as acidic dyke extending in the northeast direction for a distance of about 10.5 km with thickness varying from 0.6 to 8 m.

Both the metavolcanics and the dyke are unconformably covered by the Nubian Sandstones formation in the southwest corner of the area. The metavolcanics are affected by a series of subparallel faults trending to the NW-direction (Fig. 3). They comprises the metabasaltic, metandesitic, metadacitic and metapyroclastic rocks. The metabasalts occur as low elevated hills in the northeastern part of the area. They are of dark grey to pale green in color, massive and sometimes foliated.

Um Doweilla dyke reach about 11 km length varying in width from 0.6 m to 8 m striking in the N 33 E direction. It crops out south Wadi Al Allaqi and southwest Gabal Filat, penetrating the metavolcanics. A series of subparallel faults penetrate the dyke with varying strike-slip components trending to NNW direction causing segmentation of the dyke (Fig.4). The northern part of the dyke occurs as fine grained grey rock representing the unaltered part of the dyke with small width at its NE end (0.6 m), (Fig.5) . The unaltered part of the dyke is surrounded from the east by metabasalts and from the west by metadacite extend about 3 km. In the central and southwestern parts, the thicknesses of dyke reach to 8m. The rocks are fractured and sheared due to closer spacings of the faults. They were subjected to hydrothermal alteration mainly silicification, ferrugination and Mn-denderitic along joints and fractures (Fig. 6). The dyke cuts the metandesites in the central part of the area, and the metapyroclastics in the southwestern part. The part of the

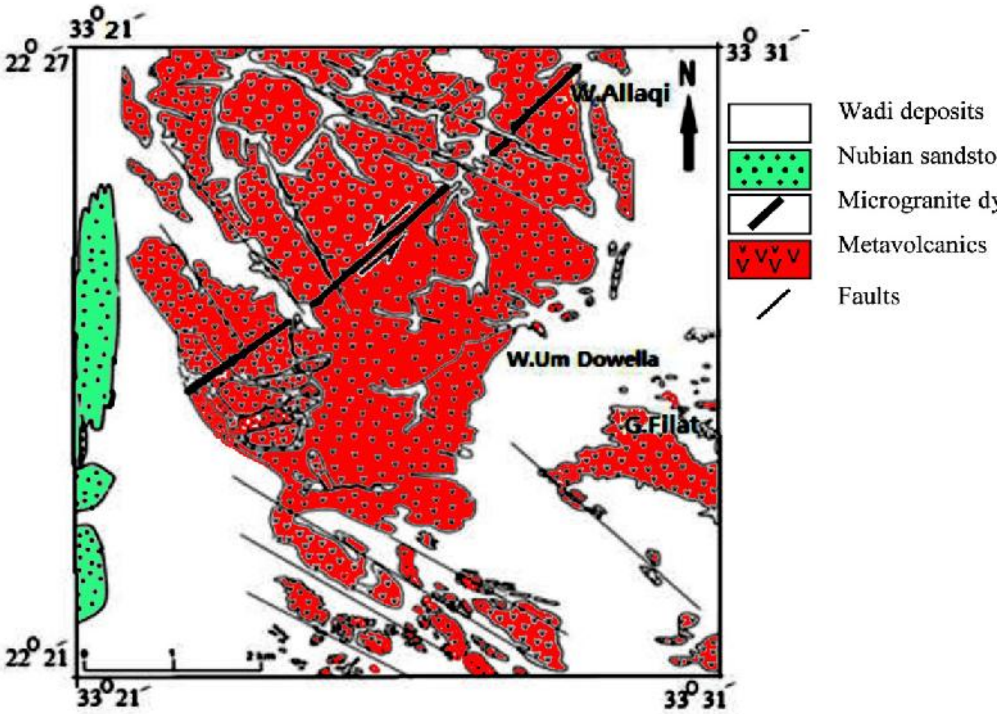


Fig. 2: Geological map of Um Doweila area, South Eastern Desert, Egypt (Modified after Gado, 1993).

Fig. 3: General view for the rhyolite dyke in W. Um Doweila, looking West

Fig. 4: General view of rhyolite dyke intruding the strongly foliated metavolcanics W. Um Doweila, looking E.

Fig. 5: General view of rhyolite dyke intruding the main trend of metavolcanic in W. Um Doweila

dyke that associates the metapyroclastics is enriched with U-mineralization with variable concentrations depending on the degree of hydrothermal alteration. In the southwestern corner, the dyke rocks and metavolcanics are overlain unconformably by Nubian sandstone.

PETROGRAPHY

The dyke and its surrounding country rocks were prepared as thin sections and examined by the polarized microscope; the dyke is mainly of granitic composition characterized by grayish pink color where the potash feldspar is the main feldspar; it is fine-grained rock with obvious porphyritic texture.

Microscopic investigation revealed that the phenocrysts are mainly quartz, orthoclase and microperthite (about 2mm length) set in a groundmass of the same minerals as fine-grained crystals with grain lengths about 1.2mm (Fig.7). The potash feldspar is the main constituent representing the main feldspar; while the plagioclase present as zoned crystals enclosing minute crystals of fluoroapatite (Fig. 8). Quartz constitutes 30-40% of the rock as skeletal crystals and as very fine crystals participate the potash feldspar to form the graphic texture (Fig. 9). They are associated with fine flakes of mica minerals as biotite that slightly folded and partially transformed to muscovite (Fig. 10). Mica minerals occupy the interstitial spaces representing about 4.5% of the whole rock composition. The rock is dominated by zircon, apatite, monazite and fluorite as the main accessory minerals. On the other hand, the rock grades in color from brownish to reddish brown in some parts according to transformation of the biotite to secondary muscovite and chlorite excluding iron oxides along the cleavage planes. Also, the quartz and potash feldspars are stained by iron and the potash feldspars are sericitized excluding the secondary quartz (silicification) according to the equations of Walther (2005): This part is of the dyke is enriched by uranium in the form of uranophane mineral.

$$3KAlSi_3O_8 + 2H^+ \leftrightharpoons KAl_3Si_3O_{10}(OH)_2 + 6SiO_2 + 2K^+$$

K- feldspar *Sericite* *Quartz*

Microscopic examination of the country rocks revealed that they are metavolcanics represented mainly by metabasalts, metandesites, metadacites and metapyroclastics.

The Metabasalt

The Metabasalt is deep green to blackish green in color. They are mainly composed

Fig. 6: Close up view for dentretic Mn-oxides and epoditized minerals of metavolcanic in W. Um Doweila

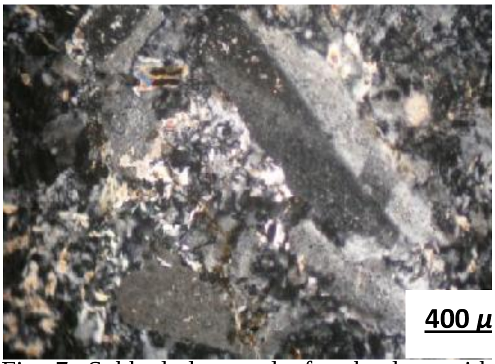


Fig. 7: Subhedral crystal of orthoclase with Carlsbad twinning, microgranite dyke in W. Um Doweila, XPL

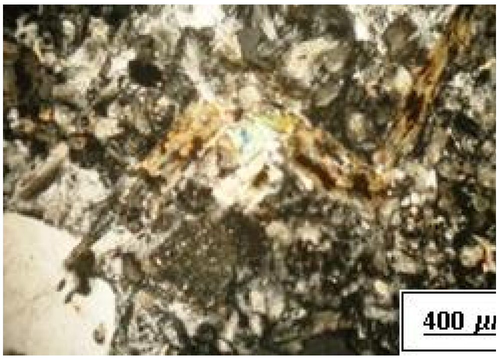


Fig. 10: Micro-folded biotite flake excluding iron oxides, microgranite dyke in W. Um Doweila, XPL

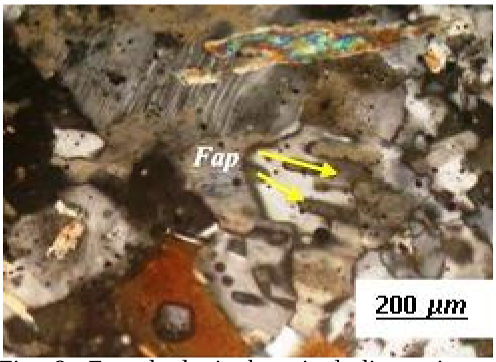


Fig. 8: Zoned plagioclase including minute crystals of fluorapatite associated with biotite, microgranite dyke in W. Um Doweila, XPL

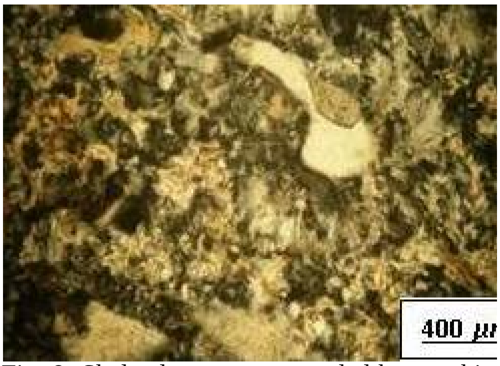


Fig. 9: Skeletal quartz surrounded by graphic texture and partially sericitied perthite, microgranite dyke in W. Um Doweila, XPL

of plagioclase (Fig. 11). The groundmass consists mainly of very fine plagioclase crystals, epidote, zoisite, sericite, tremolite-actinolite and chlorite as well as iron oxides. Plagioclase of labradoritic composition (An_{53-55}) occurs as euhedral to subhedral as well as small crystals in the groundmass occasionally altered to sericite and epidote. Hornblende is present as subhedral prismatic phenocrysts and commonly showing simple twining. It is partially altered to chlorite and tremolite-actinolite especially along the grain boundaries. Augite occurs as interstitial subhedral crystals and commonly altered to fibrous tremolite-actinolite (Fig.12). Tremolite-actinolite is the most abundant secondary mineral formed after augite and hornblende. Epidote and zoisite are mainly formed after plagioclase. Iron oxides are the most common accessories associated with altered ferromagnesian minerals.

The Metaandesite

The metaandesite is greenish grey in color; essentially composed of altered phenocrysts of plagioclase and hornblende embedded in a fine-grained groundmass (Fig.13). The groundmass consists of green pleochroic hornblende or its tremolite-actinolite variety with some plagioclase crystals, interstitial quartz and clusters of epidote as well as iron

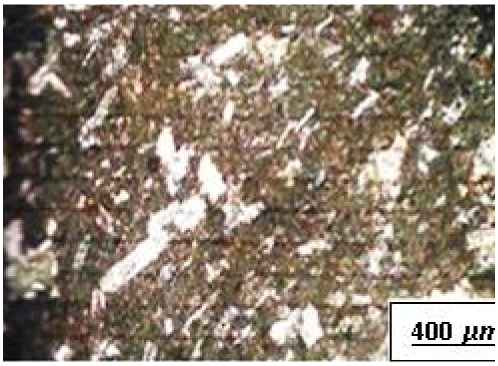


Fig. 11: Oriented crystals of plagioclase in the studied metabasalt of W. Um Doweila, XPL

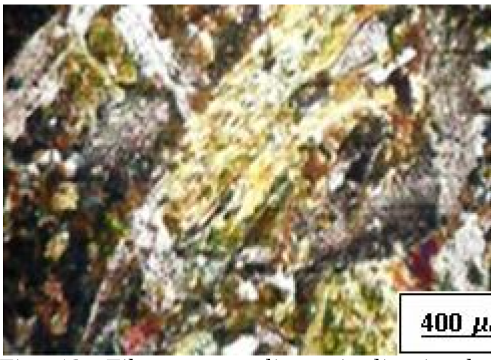


Fig. 12: Fibrous tremolite-actinolite in the studied metabasalt of W. Um Doweila, XPL

oxides. Plagioclase of andesine composition (An_{35-45}) is the dominant component in these rocks and occurs as colorless to cloudy, subhedral to euhedral phenocrysts.

Hornblende is represented by anhedral to subhedral phenocrysts and minute crystals in the groundmass. Hornblende is moderately to highly altered to tremolite-actinolite or a mixture of chlorite and epidote (Fig. 14).

The Metadacite

The Metadacite is dark grey and very fine-grained rock. They are characterized by compact appearance slightly banded where the groundmass is dominated by elongated and oriented crystals of quartz, muscovite and plagioclase (Fig. 15). Plagioclase is the main feldspar occurring as very fine lathes in the groundmass and as euhedral phenocrysts. They are characterized by albitic and percline twining; mostly composed with Carlsbad twining (Fig. 16). Potash feldspar is less dominant occurring as phenocrysts of orthoclase perthite with irregular boundaries where they are corroded by the thermal effect of the groundmass. Few flakes of biotite are recorded as stretched porphyroblasts associating the plagioclase phenocrysts.

The Metapyroclastic

The metapyroclastic is crystal-lithic py-

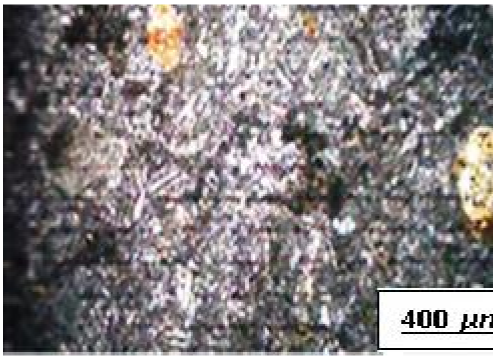


Fig. 13: Groundmass of plagioclase and hornblende with simple twining in the studied metaandesite of W. Um Doweila, XPL

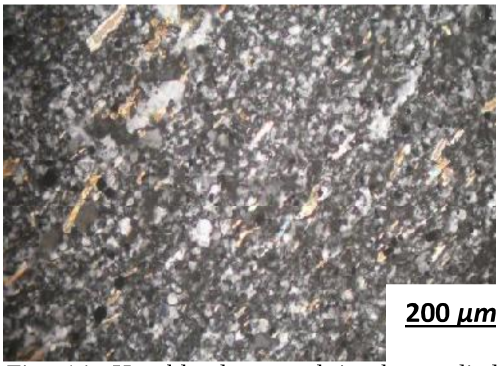


Fig. 14 :Hornblende crystal in the studied metaandesite of W. Um Doweila, XPL

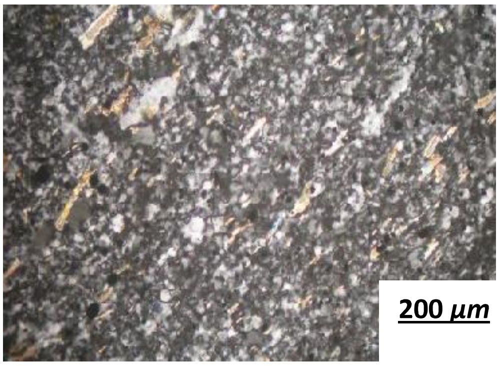


Fig. 15: Oriented crystals of quartz, plagioclase and muscovite in the studied metadacite of W. Um Doweila, XPL

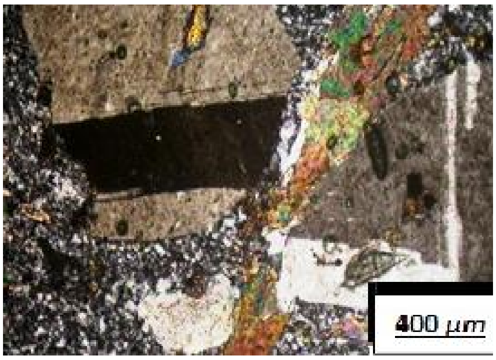


Fig.17: Porphyroclasts of plagioclase and biotite in the studied metapyroclastics of W. Um Doweila, XPL

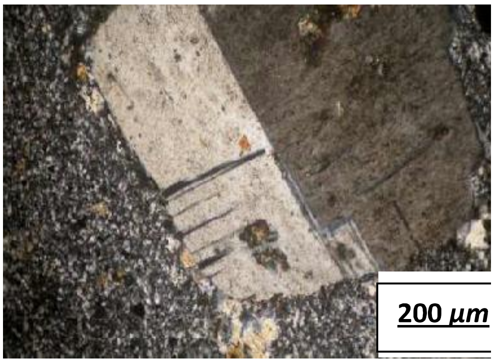


Fig.16: Phenocryst of plagioclase with percline twining composed with Carlsbad twining in the studied metadacite of W. Um

roclastic that characterized by presence of porphyroclasts of plagioclase and biotite in cryptocrystalline groundmass (Fig. 17). Also, it includes rock fragments (> 2mm diameter) of basaltic and dacitic compositions.

GEOCHEMISTRY

Eight samples representing the fresh part of the dyke under consideration were analyzed for major oxides and some trace elements at Nuclear Materials Authority and results are listed in (Table 1).

Plotting of SiO_2 versus (Na_2O+K_2O) on the classification diagram of the Cox et al. (1979) and SiO_2 versus Zr/TiO2*0.0001 classification diagram of Winchester and Floyd (1977), (Figs.18&19) indicated that the analyzed samples fall in the field of rhyodacite to ryholite as the volcanic equivalent for the granitic rock.

The tectonic setting could be defined by plotting Rb, versus (Nb+Y) on the discrimination diagrams of Pearce et al. (1984) verifying that the analyses plot in the field of within plate granite (Fig. 20). On the other hand, plotting of SiO_2 versus Al_2O_3 on the discrimination diagram of Maniar and Piccoli (1989) indicated that the samples are mostly related to the field of Post orogenic granites (Fig. 21).

RADIOACTIVITY

Field radiometric measurements carried out by the scintillometer GR-110 show low contents of radioactivity except sample D10 that taken from the southern part and characterized by field measurement about 6000 cps (anomalous zone). The northern part has low measurements and there is no visible secondary uranium mineral.

These samples were measured in the radiometric laboratory in Nuclear Materials

Table 1: Major oxides (wt %) and trace elements (ppm) for the studied dyke

Sample No.	D8 (+)	D9 (+)	D11 (+)	D15 (+)	D17 (+)	D18 (+)	D23 (+)	D28 (+)
SiO_2	74.3	70.1	71.7	71.8	70.5	69.5	71.2	70.1
TiO_2	0.31	0.42	0.26	0.15	.52	1.1	0.14	0.4
Al_2O_3	13.7	13.4	13.2	13.2	13.1	12.1	13.12	13.9
Fe_2O_3	2.07	3.6	2.39	3.4	4.1	3.3	3.4	3.3
MgO	016	.28	2.1	044	1.2	1.3	0.8	1.33
CaO	1.56	1.73	4	1.9	3.6	2.7	3.4	3.02
Na_2O	4.4	4.8	3.6	4.7	3.5	4.6	3.1	3.9
K_2O	3.1	2.9	1.3	2.6	2.5	3.2	2.1	2.5
P_2O_5	0.04	0.01	0.01	0.02	0.06	0.08	0.06	0.07
L.O.I.	1.92	2.25	1.8	2.3	1.9	1.6	1.9	1.6
Total	101.56	99.94	100.36	100.51	100.95	99.48	99.49	100.12
Cr	36	31	36	35	32	36	37	35
Ni	7	6	6	6	7	6	7	6
Cu	14	18	13	14	13	15	16	13
Zn	36	40	34	37	34	32	38	29
Zr	162	166	137	138	147	151	146	161
Rb	109	109	212	82	101	112	105	132
Y	111	116	96	92	100	103	99	111
Ba	279	300	300	276	282	292	290	291
Sr	6	6	5	5	5	6	5	6
Ga	27	25	26	28	27	26	27	25
V	4	7	6	7	9	8	9	7
Nb	54	52	56	56	54	53	55	53

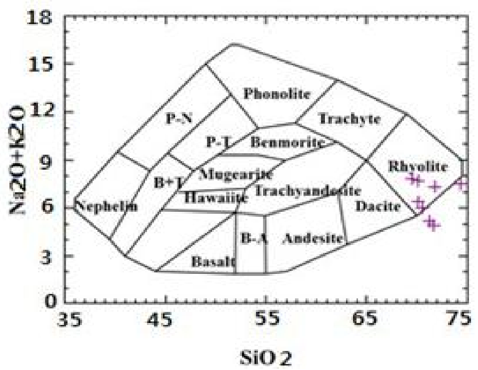


Fig. 17: Porphyroclasts of plagioclase and biotite in the studied metapyroclastics of W. Um Doweila, XPL

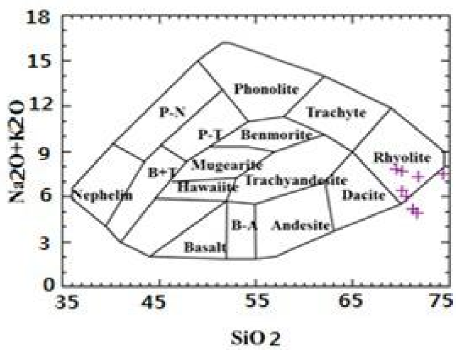


Fig 18: SiO_2-(Na_2O+K_2O) classification diagram (Cox et al., 1979) for the studied rocks of W. Um Doweila

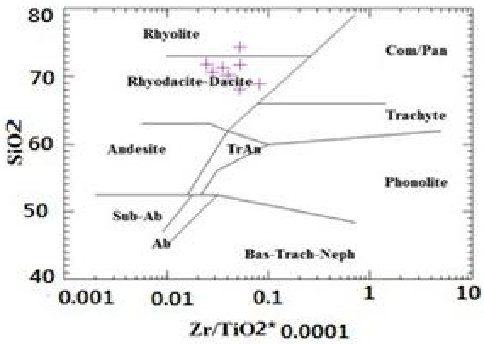


Fig. 19: (Zr/TiO2*0.0001) - SiO_2 classification diagram (Winchester and Floyd, 1977) for the studied rocks of W. Um Doweila

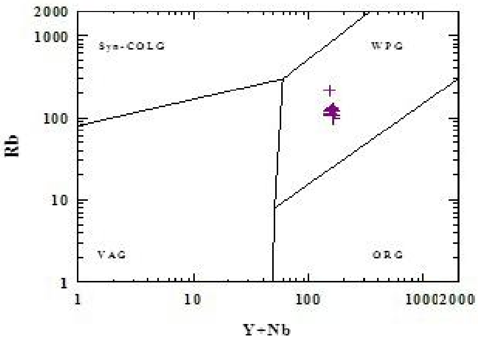


Fig 20: (Nb+Y)-Rb discrimination diagram (Pearce et al., 1984) for the studied rocks of W. Um Doweil

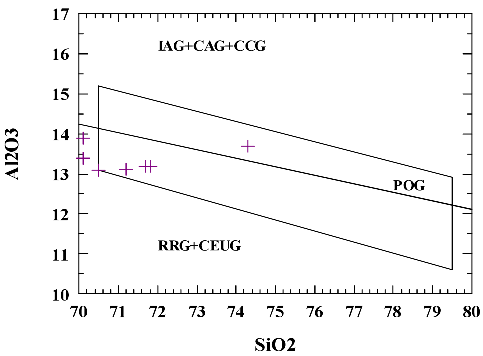


Fig. 21: SiO_2-Al_2O_3 discrimination diagram (Maniar and Piccoli, 1989) for the studied rocks of W. Um Doweila

Authority for their eU, eTh, and K% contents using a high efficiency multichannel analyzer of γ-ray spectrometer NaI (Tl). The radiometric measurement for these radionuclides was carried out through four energy regions and the data listed in (Table .2). The samples that picked from the northern and central parts characterized by low radioactivity with uranium range (7-10ppm) and thorium range (2-6ppm), on the other hand the samples that picked from the southern part is highly radioactive with uranium content 20ppm and thorium content 6ppm. Th/U ratio is very low (average 0.23 and 0.3) rather than the world value (3.5) referring to that uranium is enriched epigenetically.

The relation between eU and eTh may indicate the enrichment or depletion of U because Th is chemically stable. The relation between the U and Th contents is examined by plotting the eU contents against eTh contents (Fig. 22). It shows strong positive correlation between both U and Th, indicating their enrichment with magmatic differentiation. The variation between the eU/eTh ratios and eU-contents (Fig. 23) shows slightly positive linear correlation suggests enrichment of uranium relative to thorium which may be attributed to the presence of accessory minerals or as indicate that the secondary process played main role in uranium enrichment which may suggest that uranium had been added to these granites in post magmatic stage. Mineralogical study indicated that the studied rock is dominated by violet fluorite stained by iron oxides (Fig. 24). Oftenly, it is associating uranophane that present as aggregates of needle-like crystals characterized by butter yellow color with resinous luster. The grains are mottled by iron oxides (Fig. 25).

ESEM spectrograph and EDX analysis confirms the chemical composition of uranophane *(Ca(UO2)2SiO3(OH)2•5(H2O),* with high uranium content (64.88%) and appreciable contents of silicate (15.46%), potassium (3.63%) and calcium (5.39%). Presence of the iron oxides (6.32%) suggests the epigenetic origin and that the hydrothermal solutions are responsible for the reformation of uranophane contemporaneous with the deposition of the iron oxides (Fig. 26).

Table 2: Spectrometric analyses of Tc_1,Tc_2, U (ppm), Th (ppm) and K (%) for the low-radioactive and anomalous parts of the microgranitic dyke in Um Doweila

St. No	Tc_1	Tc_2	U (ppm)	Th (ppm)	K%	Th/U
Low- radioactive part of the dyke +						
D8	177	70	10	4	12	0.4
D9	156	55	8	3	9	0.38
D11	151	52	8	6	9	0.75
D12	177	57	8	2	10	0.25
D13	175	56	7	2	10	0.28
D14	149	46	7	2	9	0.28
Av						0.39
Anomalous part of the dyke ○						
D 10	562	172	20	6	14	0.3
D15	560	169	19	5.5	16	0.28
D16	555	167	17	4	15	0.23

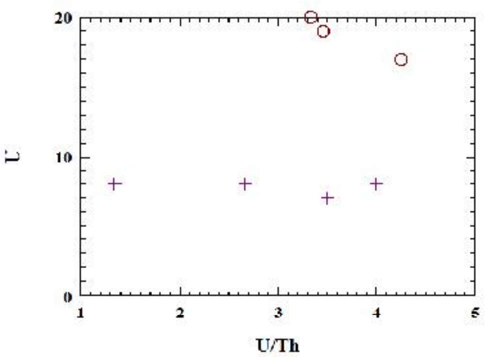


Fig. 22: U-Th variation diagram for the studied microgranitic dyke of W. Um Doweila

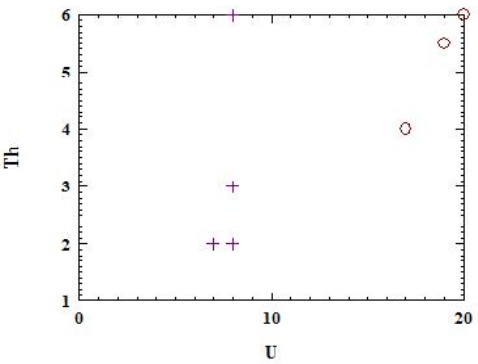


Fig. 23: U – (Th/U) variation diagram for the studied microgranitic dyke of W. Um Doweila

Fig. 24: Violet fluorite coated by iron oxides separated from the microgranitic dyke of W. Um Doweila

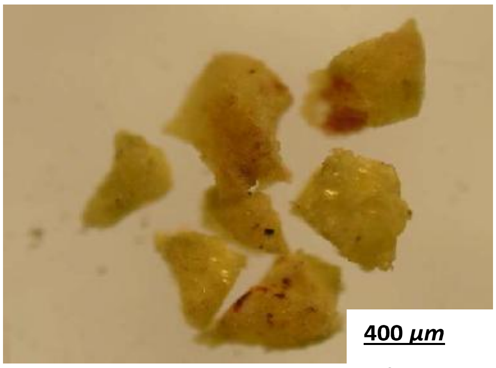


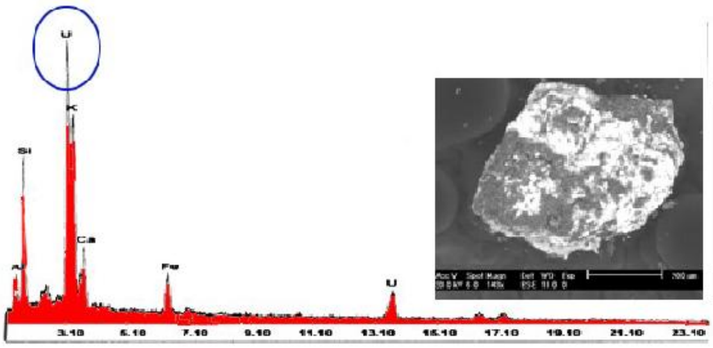
Fig. 25: Uranophane separated from the microgranitic dyke of W. Um Doweila

DISCUSSION AND CONCLUSION

Um Doweila area is covered by metavolcanics and sandstone , characterized by presence of an elongated dyke extending about 10.5 km in a NE-SW direction. Microscopic investigation revealed that the dyke is microgranitic in composition. The rocks of the dyke are of calc-alklaine and of within plate post orogenic tectonic setting.

The southern part of the area is tectonized and dissected by a set of faults, hence the dyke is traversed by several faults which permit circulation of the hydrothermal solutions. In turn, the southern part of the dyke is subjected to a process of metasomatism by those solutions and enriched by uranium. In the same time, this process led to seicitization and silicification of the potash feldspars, and the liberated silica recombined with transported uranium to form uranophane as the main uranium mineral.

From these results, it is concluded that lithology is not the sole factor that controls on the radioactivity proved by the low radioactivity of the northern part of the dyke as the proper rock. On the other hand, the southern part that dominated by field structures (joints, faults and tectonism) is characterized by high radioactivity and record of uranium minerals (uranophane). Hence, the present work attributed the anomaly of radioactivity in the acidic dyke in W. Um Doweila (microgranitic dyke) to the structure effect and metasomatism; so it is considered as structure-controlled radioactivity.



Element	Wt%	At %
Al k	4.32	12.11
Si k	15.46	41.58
K K	3.62	7.01
Ca K	5.35	10.16
Fe K	6.32	8.55
U L	64.88	20.59
Total	100	100

Fig. 26: ESEM spectrograph and BSE image of uranophane tailed with EDX analysis separated from the microgranitic dyke of W. Um Doweila

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تأثير التراكيب الجيولوجية فى تركيزات اليورانيوم عبر قاطع الميكروجرانيت فى منطقة وادى ام دويله, جنوب الصحراء الشرقيه مصر

جيهان بكر الشايب

تتغطي منطقة أم دويلة بالصخور الرسوبية المتحولة والصخورالنارية المتحولة وتتميز بوجود قاطع طويل يمتد لحوالي ١٠٫٥ كيلومتر في إتجاه شمال شرق-جنوب غرب. أوضحت الدراسات الميكروسكوبية أن هذا القاطع يتكون من صخور الجرانيتات دقيقة التحبب وتكتونيكا تظهر الدراسة أنها ذات خصائص كلسقلوية وأنها نشأت فى بيئة تصادمية بعد مرحلة التجبل الأخيرة. تأثرت المنطقة الجنوبية تكتونياً بشدة ويمر بها العديد من الفوالق والتي بدورها تمر بالقاطع مما يسمح بمرور المحاليل المائية الحارة ولذلك فإن الجزء الجنوبي من القاطع تعرض لعملية الميتاسوماتيزم بواسطة هذه المحاليل وأثرته باليورانيوم .ويستتنتج من ذلك أن المحتوي الصخري ليس فقط من يتحكم بالإشعاعية لأن الجزء الشمالي من القاطع بالرغم من إنه نفس التركيب الصخري للجزء الجنوبي إلا أنه يسجل قراءة منخفضة إشعاعياً وهذا يدل علي تأثير التراكيب علي النشاط الإشعاعي للمنطقة.