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## **NEW OCCURRENCE OF POLYMETALS MINERALIZED PEGMATITES IN THE OLDER GRANITOIDS, WADI EL SHEIH AREA, CENTRAL EASTERN DESERT, EGYPT.**

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### **ABSTRACT**

New occurrences of rare metals- radioactive mineralized pegmatites are recorded Wadi El Sheih located along Qena-Safaga road Central Eastern Desert. The investigated pegmatites are exposed in the eastern and western banks of Wadi El Sheih. The rocks hosting the radioactive pegmatites are older granites of the type's tonalite and granodiorite. According to the geologic investigations, petrographic studies, radioactivity and mineral composition, the studied radioactive pegmatites comprise three categories, namely weak 800 to 1000 Cps (WRP), moderate 1000-2500 Cps (MRP) and high radioactive pegmatites 2500 up 12500 Cps (HRP) types. The WRP and MRP are modes of occurrence generally occur as small to medium vein, dyke, rounded and elliptical unzone and occasionally zoned pocket and lenses types. The mineralized bodies of WRP type located in NNE-SSW, NE-SW intersection, while MRP types are mainly occurring at the intersection of and E-W and NE-SW fault trends. The HRP type occurs as a large size up to few meters, pockets of elliptical to irregular shape, and its radioactive anomalies are mainly controlled with intersection of both NNE-SSW and NE-SW with E-W trends. The petrographic and mineralogical studies revealed that WRP type is bearing zircon, allanite and titanite, while the MRP possesses uranotorite and zircon. The HRP type displays enrichment of the high radioactive minerals contents namely, aeschynite and niobaeschynite with accessories ilmenite, allanite and uranotorite. Aeschynite and niobaeschynite minerals have the high U and moderate Th values compare to other identified radioactive minerals.

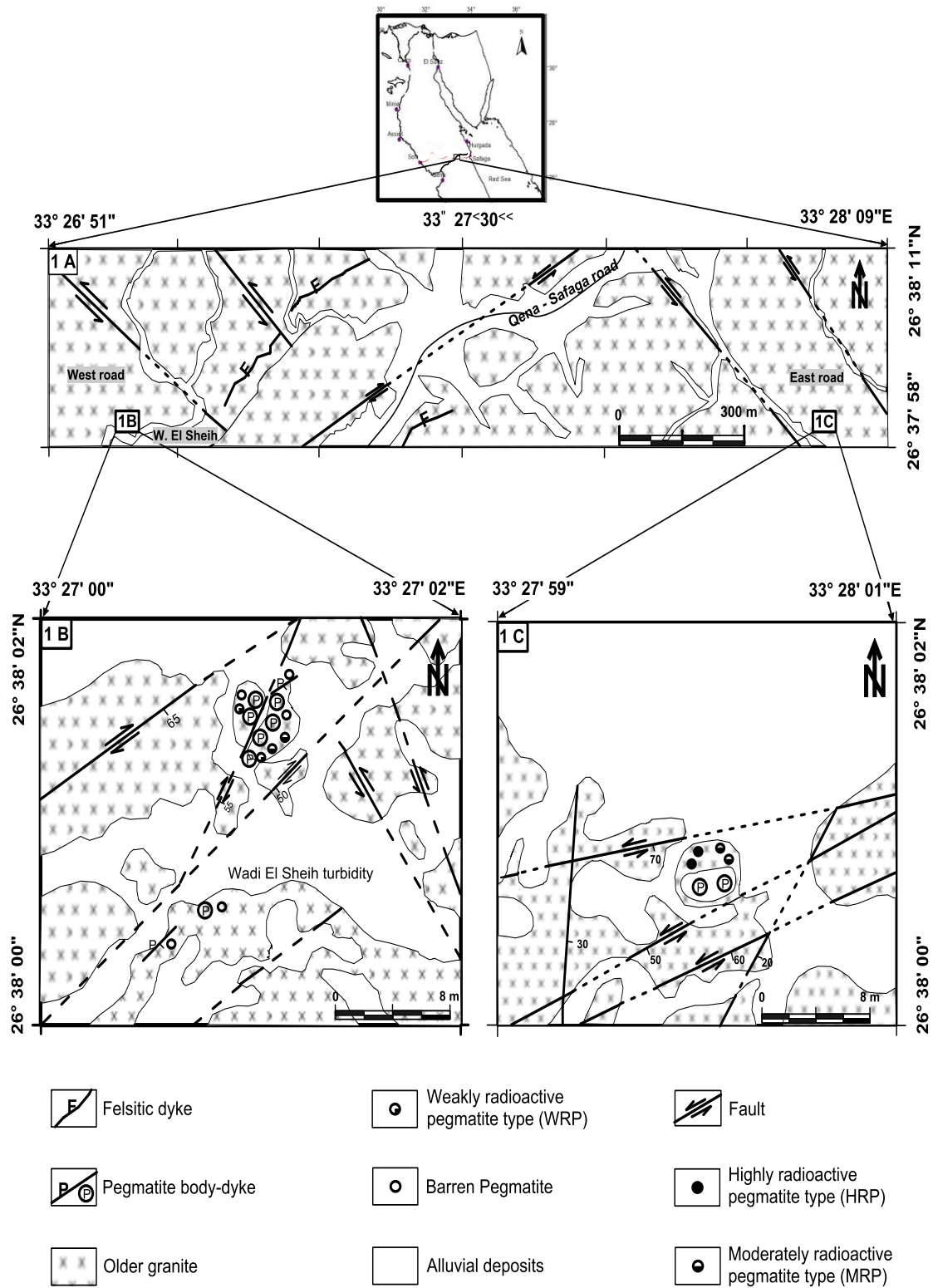
**Keywords:** polymetal pegmatites - Aeschynite – Niobaeschynite minerals- Allanite - Eastern Desert.

### **INTRODUCTION**

Kandil (2015) identified ilmenite, magnetite, zircon, titanite and monazite in the stream sediments of wadi El Sheih. Wadi El Sheih area is located in the Central Eastern Desert, of Egypt bounded by latitudes 26° 37' 58''–26° 38' 11'' N and longitudes 33° 26' 51''–33° 28' 09'' E Fig.( 1A, B&C). Generally, the younger granites are considered as a common genetic host for many of the rare-metal bearing pegmatites. Several studies have concerned the presence of granite-pegmatite – hosted rare-metal mineralization in CED, especially Nb-Ta oxides, thorite and zircon (Hassan and Kaoud, 1987; Kaoud, 1982, Hussein, 1990; Mahdy et al., 1991; Sayyah et al., 1993; Surour et al., 2004 and Raslan et al., 2010, Raslan and Ali, 2011 and Raslan 2015). Otherwise, a late Precambrian biotite schist and quartzite was also recorded as a rare case country rocks enclosing pegmatite rare-metal mineralization, including cassiterite, Li rich and gemstone minerals in SED (Saleh. 2007). The

investigated area is mainly covered with only older (grey) granites rock type, which laterally dissected by some felsite dykes and many of post magmatic pegmatites. Two eastern and western separated occurrences of anomalous radioactive pegmatite bearing rare-metal mineralization, are recorded along the two banks of the Qena-Safaga road, in Wadi El Sheih area (Fig.(1A,B&C). Generally the area under the investigation is a target of hardly excavated works- mostly done by mining diggers- looking for intensive potash feldspar masses, which are used mainly in the ceramic and glass industry. These mining and excavation works exposed several studied anomalous pegmatites bodies.

In consequence, the aim of the present study is to identify the geologic setting, structural elements, as well as petrographic and mineralogical characters and its radioactivity, controlling the anomalous pegmatites, at Wadi El Sheih area.



**Fig.(1A, B &C): Geological map of the wadi El Sheih area, along Qena-Safaga road, Central Eastern Desert, Egypt.**

## II. GEOLOGIC SETTING

### Occurrence, field relations and observations

The older granite syn- to late-tectonic is referred to as gray granite (650-620) Ma, subduction-related, I-type calc-alkaline tonalite to granodiorite (Akaad and Noweir, 1980; Hassan and Hashad, 1990 and El Gaby et al., 1990). The Gray granite in the studied area occurs as low to medium isolated hills separated by wide sandy wadies and dissected by felsite and pegmatite dykes and bodies Fig. (2). The gray granites are highly jointed, fractured and characterized by spheroidal blocky exfoliation weathering Fig.(3).

Petrographically, gray granites are represented mainly by tonalite and granodiorite types. Tonalite are composed of large plagioclase plates and quartz with subordinate content of hornblende, biotite, and magnetites (Fig. 4&5), while the granodiorite type is consists of, quartz, plagioclase, potash feldspar, biotite, and hornblende as essential minerals while sphene and apatite are present as accessories minerals (Fig.6&7).

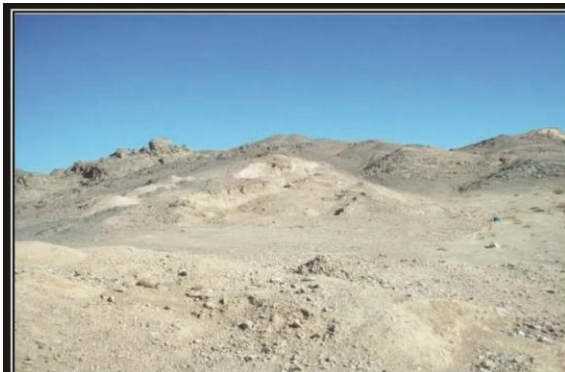
The pegmatites invaded into gray granites are ranging in size from few centimeters to few tens of meters. They occur as a sub rounded, elliptical to irregular pockets and lences, veins and dyke like bodies Fig.(8). The investigated pegmatites in general are composed of potash feldspar with quartz, plagioclase and mica. The zoned pegmatite types are composed of quartz grains; rare plagioclase and mica and/or biotite flack occupying the core, while potach feldspars enclose accessory minerals in the rim (Fig.9). Generally, the pegmatites are classified –due to its degree of radioactivity, into weakly (WRP), moderately (MRP) and highly radioactive pegmatites (HRP) types. Each type is distinguished from the other by its field geology investigations, petrographic studies, and mineralogical composition. The WRP and MRP types more widespread than the HRP type at the western sector Qena-Safaga road, while HRP type exclusively occurs at the eastern side Fig. I(A,B & C).

According to the field observations and its structural setting, WRP and MRP types are generally of medium zoned and unzoned veins, dykes and rounded to elliptical pockets and lenses up to 4.5 square meter in size, They are commonly hematized, kaolinitized, sericitized, flouritized with Mn oxides. WRP type is commonly display presence of a primary large plate's mica mineral within the potash feldspar (Fig. 10). MRP type occasionally, display a disseminated fluorite crystals and vein shape. The WRP type mainly affected with intersection of NNE-SSW and NE-SW trends occupied by mineralized matters, while the MRP type and its mineralized spots are cut by both E-W and NE-SW trends, and occasionally associated with quartz and fluorite veins (Fig 11). On the other hand, the HRP type is of elliptical to irregular pockets up to few meters in size. It stained with hematized, kaolinitized as alteration types and occasionally displays coarse disseminated fluorite crystals, compared to the fluorite vein type. Structurally, HRP type with its radioactive anomalous pockets is mainly controlled with intersection of both the NNE-SSW and NE-SW with the E-W major joints trends.

### Radioactivity

Generally, the field radiometric survey was carried out using the portable scintillometer (UG-130), measuring in terms of count per second (Cps) and determined also as an equivalent uranium (eU) and thorium (eTh). The statistically processor averages of total counts (cps), eU and eTh values for the gray granites, barren pegmatites, WRP, MRP and HRP types, are listed in (Table 1) and illustrated by histograms (Fig.12).

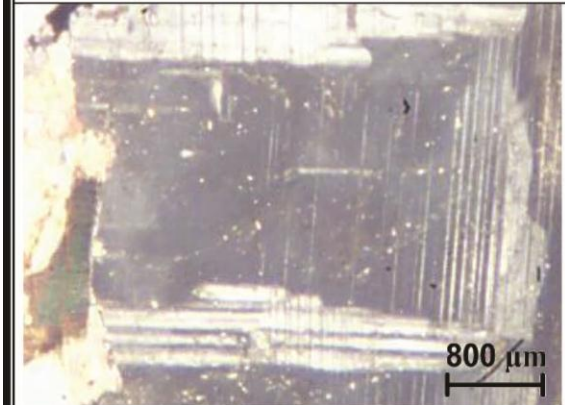
The gray granite country rock recorded the lowest of (cps) radioactive measuring values which represent its normal background radioactivity (Table1 & Fig. 12).



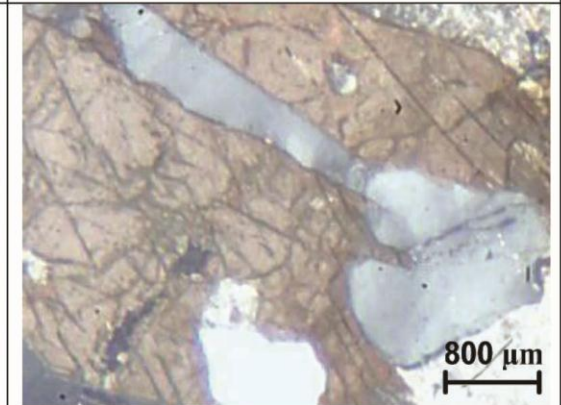
**Fig. (2):** A low to medium outcrop hills of gray granites dissected by swarms of small felsite dykes striking NE-SW, western sector, Wadi El Sheih area, looking N.



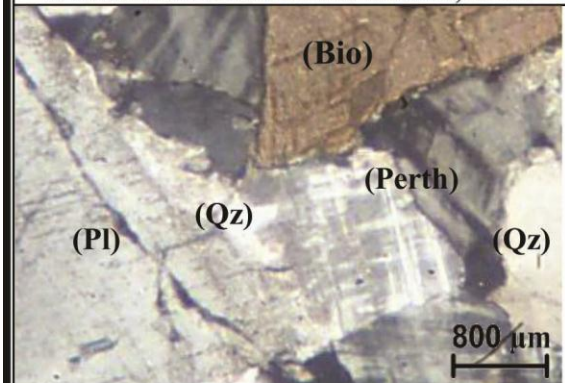
**Fig.(3):**A spheridocal blocky exfoliation weathering in gray granite, estern sector, Wadi El Sheih area, looking NW.



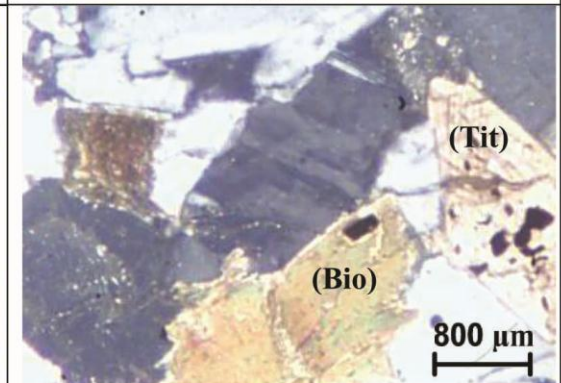
**Fig. (4):** A large plagioclase crystal showing baveno twinning partially poikilitic small altered biotite flake in the tonalite, XPL.



**Fig. (5):** Two large hornblende crystals corroded by quartz grains in the tonalite, XPL.



**Fig. (6):** A hypidomorphic plagioclase(Pl), biotite (Bio) and potach perthite (Perth) plate corded by quartz(Qz) in the granodiorite, XPL.



**Fig. (7):** Clusters of altered biotite (Bio) and sphene(Tit) crystals located among potach perthite, plagioclase and quartz grains in the granodiorite, XPL.

Table ( 1): The average of the (Tc), (eU) and (eTh) for the studied rock types.

| Series of observations<br>No #. | Av. T.C<br>(cps) | Av. (eU)<br>ppm | Av. (eTh)<br>ppm | Rock type           |                                    |
|---------------------------------|------------------|-----------------|------------------|---------------------|------------------------------------|
| 27                              | 206.5            | 2.72            | 7.44             | Gray granite        |                                    |
| 51                              | 447.42           | 5.65            | 13.59            | Barren<br>pegmatite | Non<br>mineralized<br>pegmatites   |
| 7                               | 884.3            | 12.1            | 38.5             | (WRP)               | Mineralized<br>pegmatites<br>types |
| 14                              | 1352.6           | 12.3            | 107.1            | (MRP)               |                                    |
| 3                               | 7313             | 28.7            | 769.2            | (HRP)               |                                    |

The barren pegmatites display the lowest measured values with an average equal 447 cps, (eU) equal 5.65 and (eTh) equal 13.59 ppm (Table1 & Fig. 12). Generally, The WRP type is grouped between 800 to 1000 cps, while the MRP type posses more higher values,(> 1000-< 2500 cps) with the least average values of (eU) and (eTh) (Table1 & Fig. 12). The HRP type commonly possesses the highest values from 2500 up to 12500 Cps and the highest average values of (eU) and (eTh) (Table1 & Fig. 12). While the MRP type display a moderate average value with 1325 Cps, as well as its (eU) and (eTh) values (Table1 & Fig.12).

The HRP type is exclusively containing visible mineral crystals associated with the highest radioactive values. These highly radioactive values are commonly detected in the huge excavated large irregular shape pegmatite bodies, up to few tens of meters in size (Fig. 13). After a serious excavation works which done by miming diggers- some mineralized parts are exposure belong to the (HRP) type (Fig 14). Two sketches display geological parameters which control the distribution of the mineralization and its isorad pattern, in a part of open pit high radioactive HRP pegmatite (Fig. 15&16). The mineralized spots with visible radioactive minerals are mainly controlled mainly with the intersection of NNE-SSW and/ or NE-SW with E-W trends. They are occasionally, localized at the contact between the potach feldspar and quartz bodies

The mineralized spots are mainly associated with hematization, kaolnitization and presence of flouritizations alteration types (Fig. 15&16).

### Petrography

Regarding of the petrographic studies, barren pegmatites and all the investigated radioactive pegmatites types are composed mainly of potach feldspar, quartz and occasionally biotite and mica in decreasing in order. Basically, each type of the studied radioactive pegmatites is distinguished by content and type of accessory and secondary minerals.

(WRP) type is characterized with enrichment of iron oxides hematite minerals threads filling micro-veinlets, muscovite, some biotite and small amount of zircon, allanite and sphene. **Allanite** is present in the form of small honey reddish brown crystals, and occasionally displays zonation associated with iron oxides veinlets (Fig. 17). **Zircon** occurs as minute euhedral prismatic crystal essentially enclosed in biotite and occasionally associated with sphene and muscovite (Fig. 18).

**Sphene** (Titanite) mostly displays pale brown wedge-like shaped euhedral crystals and less common as granules, mainly associated with biotite and opaque minerals (Fig.18).

Moreover, MRP type possesses the radioactive minerals, uranothorite, allanite and zircon. **Uranothorite** occurs as aggregates of small anhedral to subhedral high relief crystals, of yellow to yellowish brown in color. It is mostly associated with zircon, muscovite and opaques (Fig.19).

**Zircon** is forming minute elongated high relief crystals. It displays strong birefringence and associated with muscovite and opaque (Fig.20).



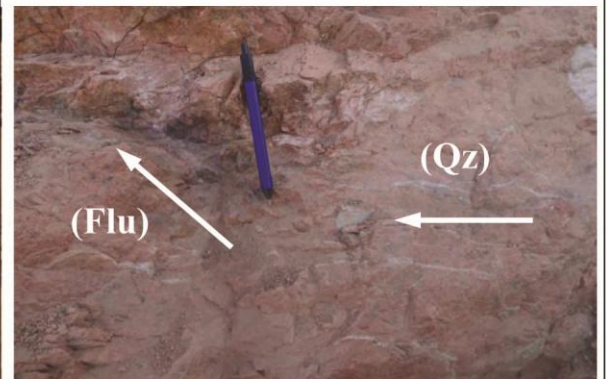
**Fig. (8):** A huge pegmatite dyke striking N45° E dissected the gray granite, Western sector Qena- Safaga road, Wadi El Sheih area, looking NW



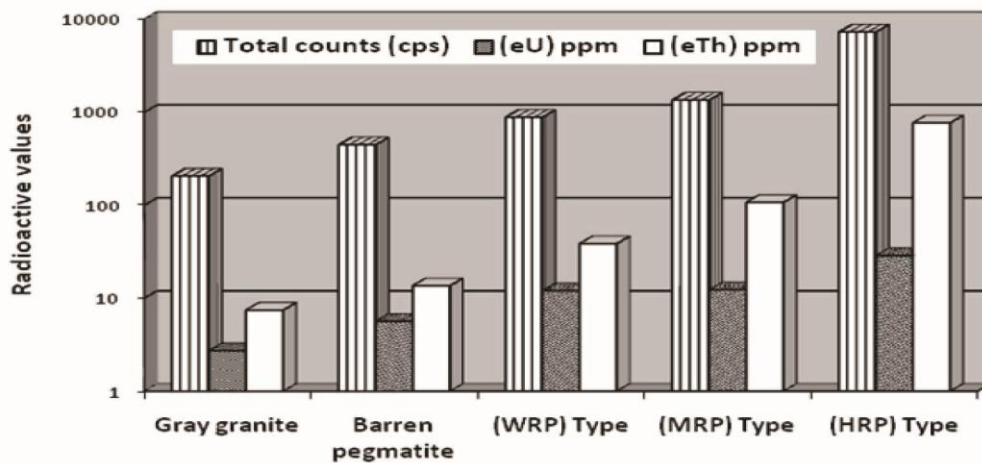
**Fig. (9):** A vertical section of excavated elliptical large zoned pegmatite lenses elongated in NE-SW trend, Eastern sector, Qena- Safaga road, Wadi El Sheih area, looking NW.



**Fig. (10):** A large primary mica plates in the (WRP) type, Western sector Qena- Safaga road, Wadi El Sheih area, Looking NE.



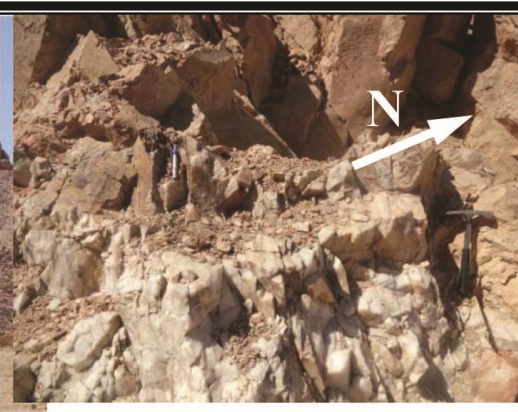
**Fig. (11):** Swarm of Quartz veins (Qz) striking (EW) intersected with fluorite vein (Flu) and pocket striking (NW), in the MRP type, Eastern sector Qena- Safaga road, Wadi El Sheih area, looking N.



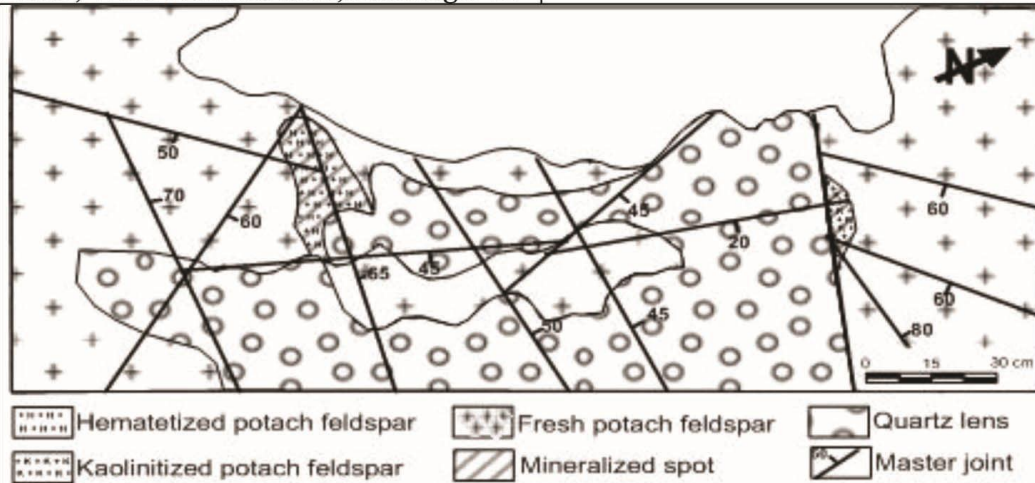
**Fig.(12):** An illustrating histogram showing an average values of the (Tc), e(U) and e(Th) for the studied rock types



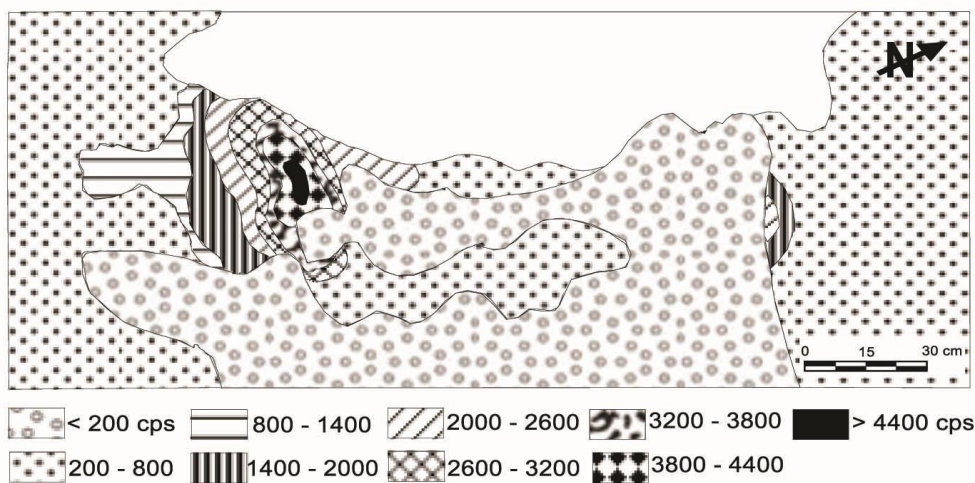
**Fig. (13):** A general view of a huge excavated body (HRP) type, intruded at the top of low hill gray granites outcrop, Eastern occurrence along Qena- Safaga road, Wadi El Sheih area, Looking SW.



**Fig. (14):** A part of excavated western wall of huge irregular pegmatite open pit showing the mineralized spots locations, Eastern sector Qena- Safaga road, Wadi El Sheih area looking W.



**Fig. (15):** A geological structural sketch for the open pit of high radioactive HRP pegmatite.



**Fig. (16):** Isorad map for the open pit of high radioactive HRP pegmatite.

**Muscovite** occurs as high birefringence anhedral laths secondary minerals (Fig.21). Opaques display either as inclusion within biotite, quartz or form veinlets and irregular grains.

Generally, the HRP type displays the most diversity occurrences of uranium, thorium and rare earth elements bearing radioactive minerals. Qualitatively, namely remarkable highly radioactive aeschynite group including aeschynite and nioboaeschynite varieties, illmenorutile, allanite and uranothorite minerals, arranged in decreasing order .

In hand specimen, Aeschynite and nioboaeschynite form well shaped crystal habit display prismatic and stubby and occasionally tabular form needle-like crystals, ranging in length less than one centimeter. Both of them occur as opaque red–brown to dark brown in color. Aeschynite and nioboaeschynite exist as disseminated individual crystals as well as in association with illmenorutile mineral and iron oxides (opaque) veins (Fig.22A).

Ilmenorutile mineral is a dull luster breakable large yellowish brown to black flatty crystals of more than one centimeters long. It exists in association chiefly with aeschynite minerals and opaques (Fig. 22B). The opaque iron oxides display thick parallel veins, rarely as grains (Fig. 22C).

In thin section, optically aeschynite and nioboaeschynite minerals often form euhedral to subhedral with prismatic and occasionally tabular crystal habits. It occur as moderate phenocryst up to 3.5×1 mm in size and display faint cleavage traces parallel to its tabular crystal edges (Fig. 23&26).

**Aeschynite and nioboaeschynite** display isotropic, translucent, transparent in very thin fragments, deep bright reddish brown color in polarized light (Fig. 23, 24&25). Both of them possess medium relief with faint zonation (Fig. 25). Aeschynite and nioboaeschynite occasionally attacked with quartz and secondary fan-shaped secondary muscovite (Fig. 24&27). Both of them occasionally

display disseminated individual single crystals mostly occur in ultimate and accompanied with ilmenorutile and opaques veins.

**Ilmenorutile** often occurs as medium to coarse prismatic octahedral or elongated crystals (Fig. 24&25) and sometimes wedge-like shaped big mineral fragments reach up to 6.8×3 mm (Fig.27) . It displays pale grayish black in color, and isotropic minerals have no birefringence color, and corroded with quartz and muscovite (Fig. 24&27).

**Allanite** occurs as a coarse prismatic euhedral crystal reach up to few centimeters long. It displays honey faint brown in color with masked interference colors. Allanite is characterized by its high relief, fractured and display microscopically perfect zonation (Fig.28).

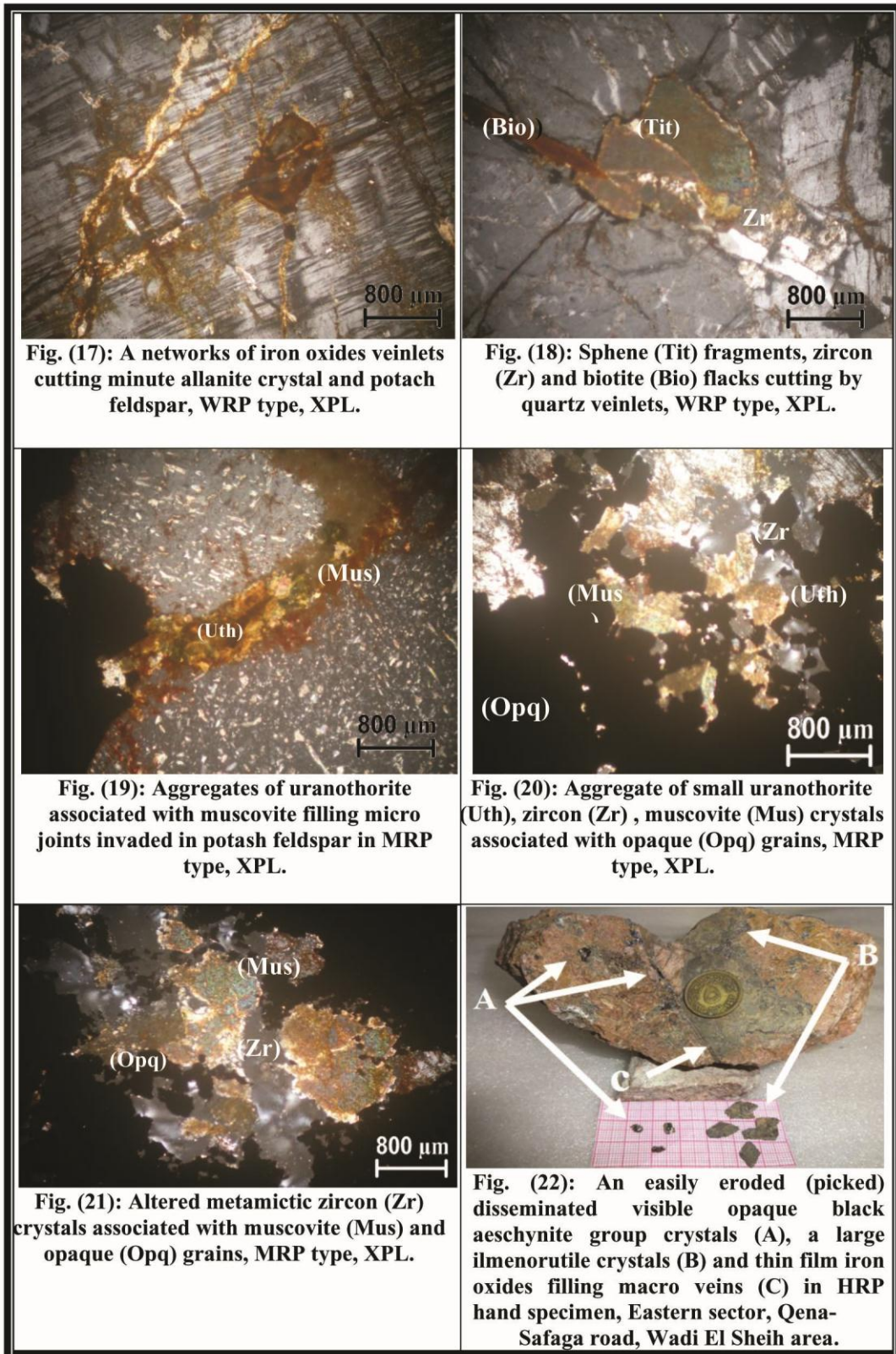
**Uranothorite** is commonly enclosed and mainly associated with opaques as an aggregate of minute crystals characterized with its high interference colors (Fig. 28).

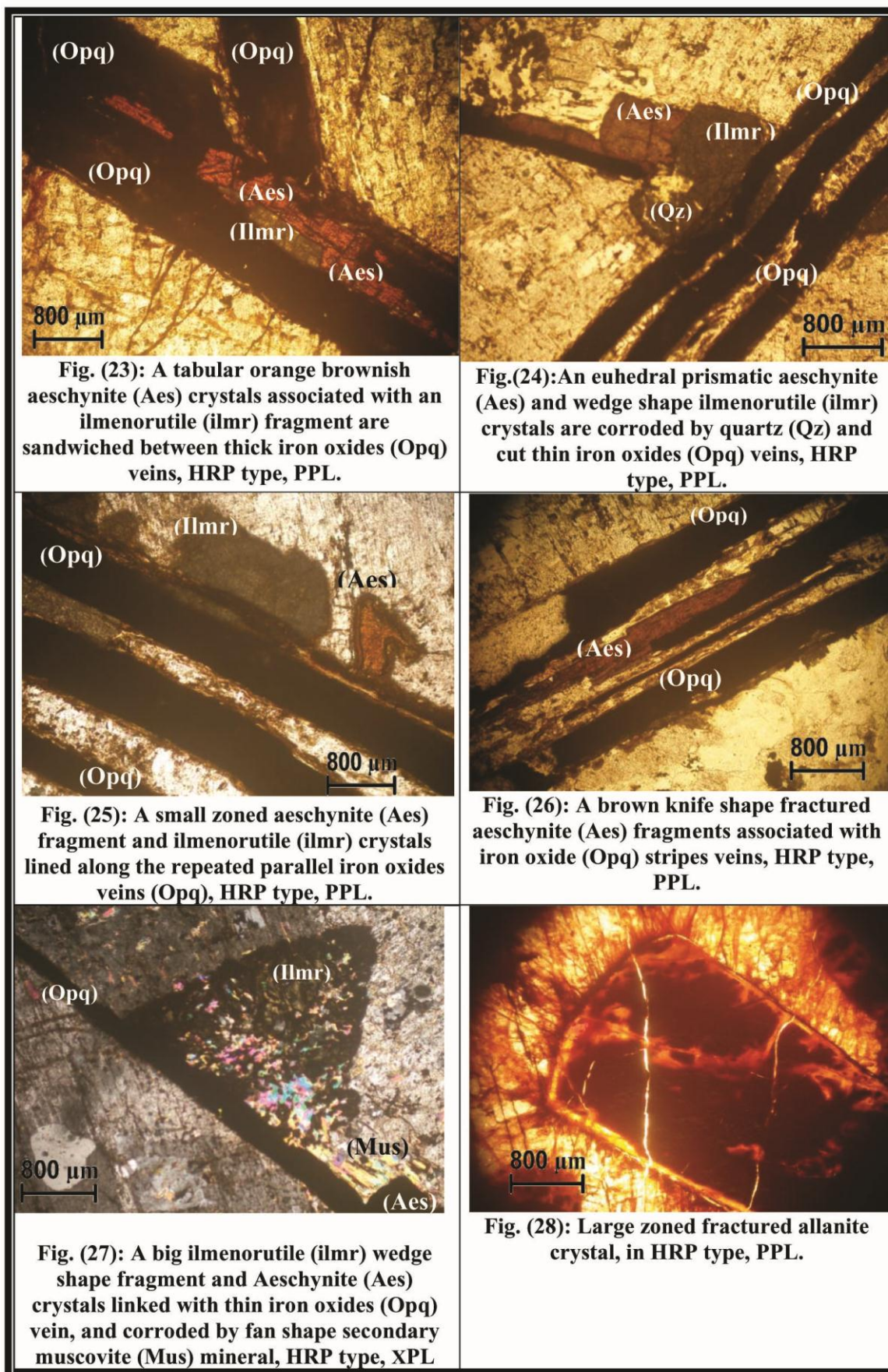
**Opaques** display an enrichment of parallel long stick like shape and occasionally occur as grains. They commonly possess faint to dark brown color and mainly associated with aeschynite and nioboaeschynite and ilmenorutile (Fig 23, 24, 25, 26&27).

### Mineralogical investigations

The collected samples from the studied radioactive pegmatites include the WRP, MRP and HRP types. They comprise both easily separated mega crystal minerals, as well as other fine crystals are detected using binocular stereomicroscope, X-ray diffraction technique. Semi quantitative EDX chemical analyses were also carried out using a Phillips XI-30 Environmental Scanning Electron Microscope (ESEM). All these analysis were carried out in the laboratories of the Nuclear Materials Authority (NMA), Cairo, Egypt. Mineralogical examination of the studied radioactive pegmatites revealed presence and distribution of some of the most uranium, thorium and rare earth elements bearing radioactive minerals as follows:







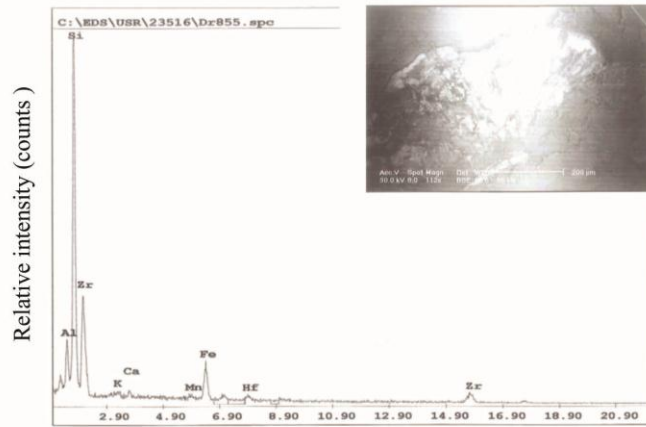


Fig. (29): BSE images and EDX charts show zircon in the studied WRP type.

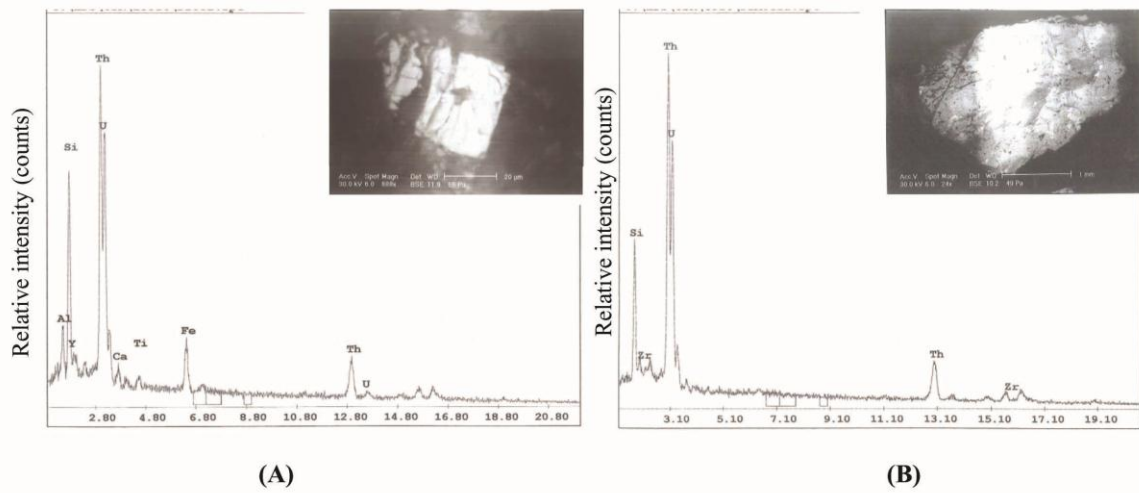


Fig. (30): BSE images of two uranothorite spots (A) and (B) in the studied MRP type.

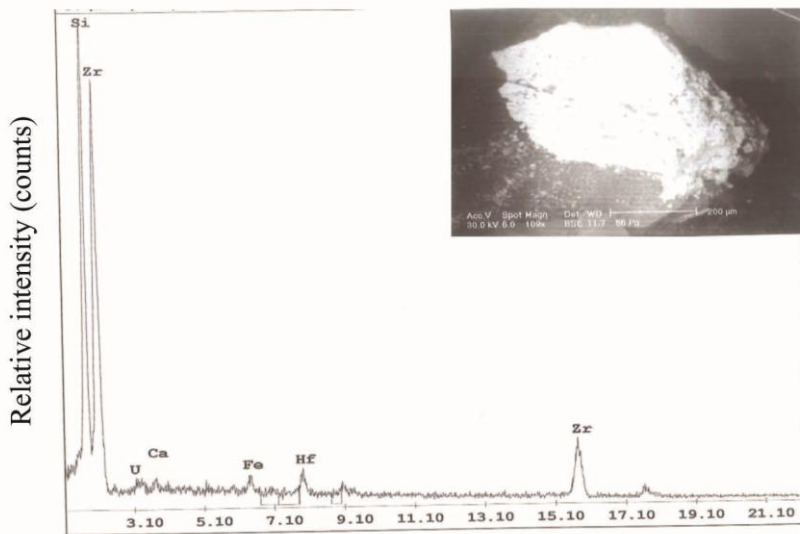


Fig. (31): BSE images show zircon in the studied MRP type.

### 1-The weak radioactivity WRP pegmatites type

#### Zircon: $ZrSiO_4$

Zircon is the chiefly radioactivity accessory mineral constituent in the WRP type, euhedral colorless to pale yellow minute crystals. The EDAX data reflect high Si (42.05 Wt%) and comparable value of Zr (37.10 Wt%) with significant amounts of Fe, Hf and Al (Fig. 29).

### 2- The moderately radioactivity MRP pegmatite type

Uranothorite and zircon minerals constitutes are identified and determined by the ESEM analysis in the studied moderately radioactivity (MRP) pegmatite type.

#### Uranothorite $Ca(UO_2)_2Si_2O_7$

Uranothorite exists as yellow to yellowish brown anhedral to subhedral crystals. The ESEM analysis for two uranothorite spots indicates that it possess a high content of Th and Si from (59.82 to 63.44 Wt%), and (11.23 to 15.12 (Wt%), respectively compatible with the standard measurements' uranothorite mineral (Fig. 30). On the other hand, abnormal value of U (12.18 to 20.84 Wt%) are recorded, compared to that given by Heinrich (1958) only up to 10% uranium in uranothorite. The other recorded elements in small to minor amounts are Fe, Zr, Al, Y, Ti and Ca.

#### Zircon ( $ZrSiO_4$ )

It is detected and recorded by the (ESEM) analysis depending on its characteristic values of Zr (69.37 Wt%) and Si (18.05 Wt%). Both Hf, U and Fe are recorded on small amounts (Fig. 31).

### 3- The high radioactivity HRP pegmatite type

The studied high radioactive pegmatites HRP type contain in decreasing order aeschnite and nioboaeschnite, ilmenorutile, allanite and uranothorite.

#### Aeshynite and nioboaeschnite

Both aeschnite and nioboaeschnite minerals occur as oxides and hydroxides following its chemical formula. The main difference between both minerals is the presence of higher niobium value in the latter

mineral nioboaeschnite. Occurrences of aeschnite and nioboaeschnite minerals are considered as first catchments in the older granitoids rocks hosting its mineralized pegmatites, Eastern Desert. The presence of both aeschnite and nioboaeschnite in the HRP pegmatite type is confirmed petrographically studies and the (ESEM) data.

#### Aeshynite (Y) (Y,Ca,Fe) (Ti,Nb) 2(O,OH)<sub>6</sub>

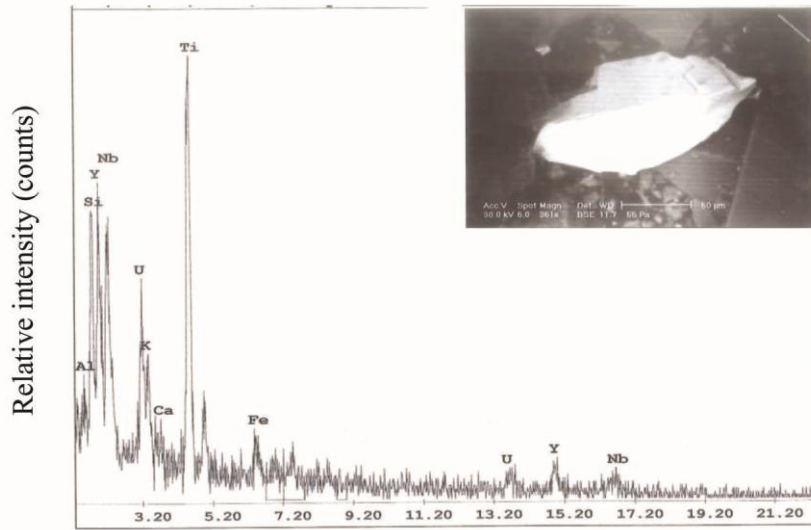
This mineral displays the (Y) aeschnite variety. The (ESEM) image and (EDX) analysis recorded comparable aeschnite (Y) values with its chemical formula where Ti, Y, and Nb values are 22.37, 19.32 and 18.59 (Wt%), respectively (Fig. 32). Moderate value of Si displays (7.25 Wt %). The elements Fe, Ca, Al and K occur lower values (less than 3.03 Wt%) . Aeshynite (Y) variety display the highest U values (up to 26.33 Wt%) is recorded in the studied HRP type,

#### Nioboaeschnite (Y) [(Y,REE),Ca,Th,Fe] (Nb,Ti,Ta) 2(O,OH)<sub>6</sub>

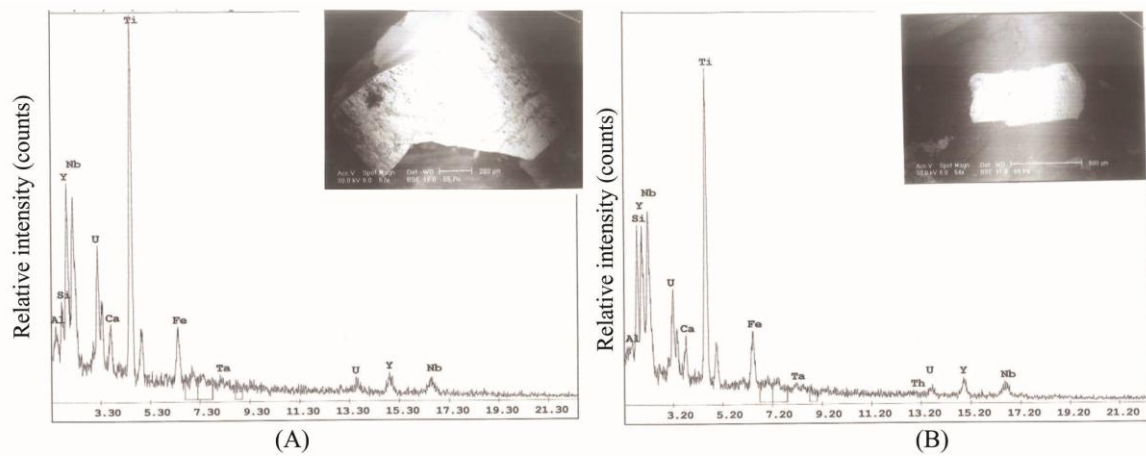
Nioboaeschnite (Y) is considered as Nb–Th bearing aeschnite mineral variety (Bermance et al, 2008). In the studied HRP type, the noboaeschnite (Y) is detected in two spots with the ESEN data (Fig. 33). Nioboaeschnite (Y) has highest Nb and Ti values reach up to 25.04 Wt% and 22.38 Wt%, respectively, while Y and U possess moderately values equal 17.36 Wt% and 15.99 Wt%, alternatively. On the other hand, Th, Si, Fe, Ta, Ca and Al are represented the small amount values (less than 6.31 Wt%). Generally, aeschnite and nioboaeschnite minerals have the highest U and moderate Th values (26.33 and 6.31 Wt%) respectively, compared to other identified radioactive minerals in the investigated radioactive pegmatite types

#### Ilmenorutile (Ti, Nb, Fe) O<sub>2</sub>

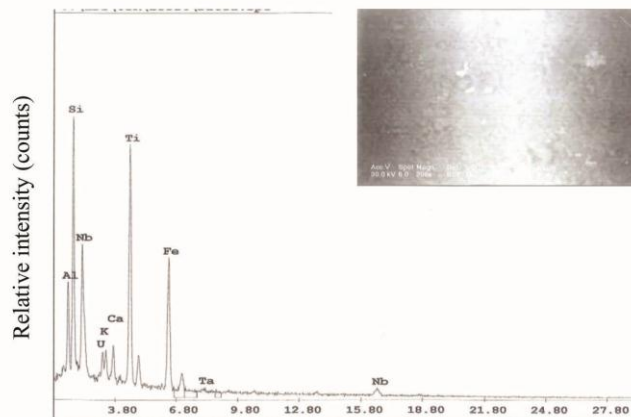
Ilmenorutile is the Nb-bearing rutile late primary mineral in granite, pegmatites, and carbonatites. The (ESEM) data recorded the chemical composition as Ti, Si, Nb and Fe values (22.96, 19.92, 19.14 and 18.98 Wt%) values, respectively (Fig. 34). Al and U contain moderate values with 7.96 and 6.67 Wt%, respectively. Both elements Ca, Ta and K recorded less than 2.58 Wt%.



**Fig. (32): BSE images showing aeschynite (Y) mineral the studied HRP type.**



**Fig. (33): BSE images and (ESEM) show two nioboaeschynite (Y) spots (A) and (B) in the studied HRP type.**



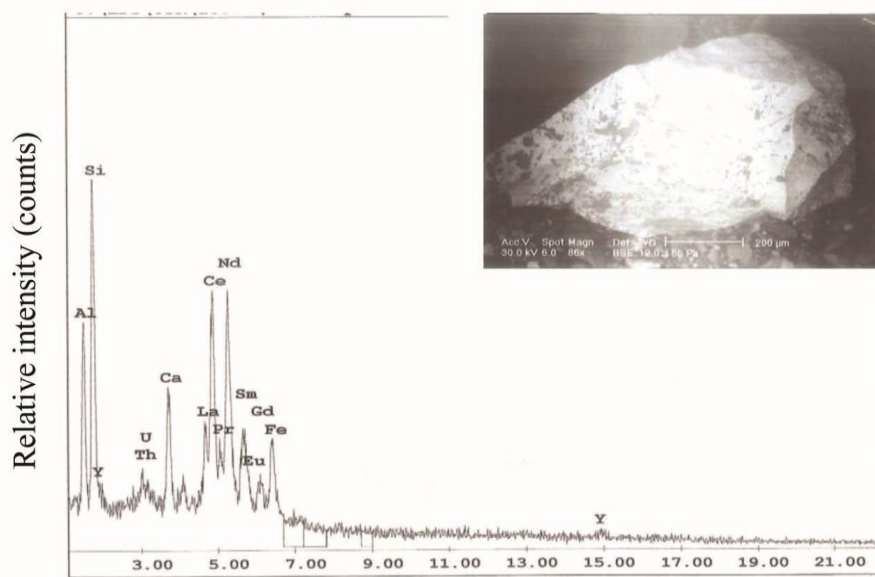
**Fig. (34): BSE images show ilmenorutile mineral in the studied HRP type.**

**Allanite (Ce, Ca, Y) 2(Al,Fe) 3(SiO<sub>4</sub>) 3(OH)**

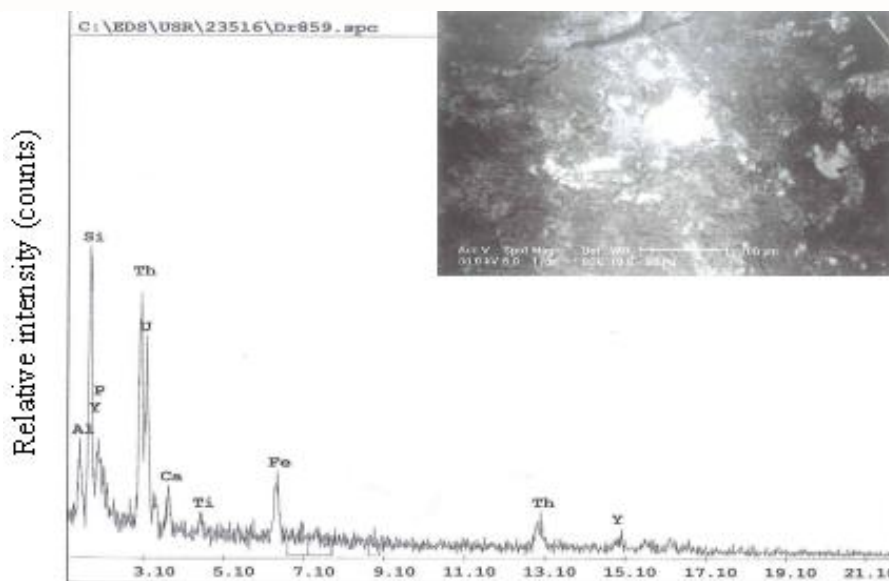
Allanite is a REE bearing rare earth elements mineral. It occurs as large honey reddish brown crystals. Allanite forms euhedral tabular prismatic crystals, up to few millimeters, with perfect zonation appearance. The (ESEM) data revealed that allanite is composed mainly of Ce, Nd, Si, Al values with 23.2, 8, 17.15, 12.45 and 10.97 Wt%, respectively while it displays small amounts of Fe, Ca, Th and U (less than 5.31 Wt% Fig. 35).

**Uranothorite (U,Th) SiO<sub>2</sub>**

The minute pale brown crystals are detected in the crushed powder of the high radioactive HRP pegmatites type. The (ESEM) data indicated that U and Th represent the two main radioactive elements (12.42% and 40.71%), respectively (Fig.36). It is like thorite but with uranium more than 10%. Silicon element is recorded in moderate percentage value (22.24% Fig. 36).



**Fig. (35): BSE images show allanite mineral in the studied HRP type.**



**Fig. (36): BSE images show uranothorite mineral in the studied HRP type.**

## CONCLUSION

The studied Wadi El Sheih area, is located in the Central Eastern Desert, of Egypt bounded by latitudes  $26^{\circ} 37' 58''$ – $26^{\circ} 38' 11''$  N and longitudes  $33^{\circ} 26' 51''$ – $33^{\circ} 28' 09''$  E, along the Qena-Safaga road, Wadi El Sheih area. It characterized with some of the mineralized pegmatites hosted by the (gray) older granites. Older granites are classified into tonalite and granodiorite in compositions.

According to the field geology investigations, petrography studies, radioactivity and mineralogical characters, the radioactive pegmatites are classified into three categories, namely weakly (WRP), moderately (MRP) and highly radioactive (HRP) pegmatites types.

The field geology investigations demonstrated the studied WRP and MRP pegmatites types as small to medium zoned and unzoned body types, veins dykes and elliptical pockets and lenses. The HRP pegmatites type displays as huge large irregular shape pegmatite bodies, up to few tens of meters in size.

Raidoactivity measurements' values for the mineralized pegmatites suggest a three separated group values depending on total count (Cps), equivalent uranium (eU) and thorium (eTh).

The WRP pegmatite type is grouped between 800 to 1000 cps, while the MRP type possess more higher values, (> 1000-< 2500 cps) with the least average values of (eU) and (eTh). The MRP pegmatites type display a moderate average value with 1325 Cps, as well as its (eU) and (eTh) values. The HRP pegmatite type commonly possesses the highest values from 2500 up to 12500 Cps and the highest average values of (eU) and (eTh).

Petrography studies revealed that each radioactive pegmatite type has its own radioactive mineralized accessory minerals types.

The WRP pegmatite type contains zircon, sphene and allanite minerals, while the MRP pegmatites type occur uranothorite, zircon and muscovite as accessory minerals. The HRP pegmatite type displays a diversity of highly

radioactive minerals such as aeschynite-niobioaeschnite, ilmenorutile, allanite and uranothorite accessory minerals.

Mineralogical examination documented the different previous investigations which carried out on the different mineralized pegmatites. The WRP pegmatites type contain zircon, while uranothorite and zircon in the MRP pegmatites type.

The HRP pegmatite type possesses aeschynite, niobioaeschnite, ilmenorutile, allanite and uranothorite as its accessory minerals. Aeschynite and niobioaeschnite minerals have the highest U and moderate Th values equal 26.33 and 6.31 Wt%, respectively.

These high radioactivity Nb-Ta family varieties with other U, Th and REE minerals bearing pegmatites in Wadi El Sheih, should be a target of enlarged economic potentialities studies for series cooperation degree in the nuclear fuel industry.

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## اكتشاف موقع جديد للبجماتيت المتمعدن الحامل للعديد من المعادن النادرة والمتواجد في الجرانيت القديم لمنطقة وادى الشيخ، وسط الصحراء الشرقية- مصر

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مدرس بهيئة المواد النووية- القاهرة – مصر

تتواجد صخور البجماتيت الحامل للعديد من المعادن النادرة فى منطقة وادى الشيخ على جانبي طريق قنا سفاجا بوسط الصحراء الشرقية . وتغطى صخور الجرانيت القديم والحاوية للبجماتيت المتمعدن منطقة الدراسة وتتكون من نوعى صخور التوناليت والجرانوديورايت. واعتمادا على كل من الدراسات الحقلية والمجهريية والخواص الاشعاعية والمحتوى المعدنى فقد قسمت صخور البجماتيت المتمعدنة الى ثلاث أنواع كما يلي: نوع البجماتيت ضعيف المحتوى الاشعاعى (800- 1000 ) نبضة اشعاعية/ثانية و البجماتيت متوسط المحتوى (1000- 2500) نبضة اشعاعية/ثانية و البجماتيت عالى المحتوى الاشعاعى (12500-2500) نبضة اشعاعية/ثانية. وقد أوضحت الدراسة الحقلية تشابة الظهور الحقلى لكل من نوعى ضعيف ومتوسط المحتوى الاشعاعى من حيث تواجدهم فى أشكال متمنطقة وغير متمنطقة وسدود وجيوب و عدسات متطاوله منها الصغيرة والمتوسطة الحجم. وتتواجد نوع البجماتيت ضعيف المحتوى الاشعاعى عند تقاطع اتجاهى شمال شمال شرق-جنوب جنوب غرب مع شمال شرق-جنوب غرب أما نوع البجماتيت متوسط المحتوى الاشعاعى فيقع عند تقاطع اتجاهى شرق- غرب مع شمال شرق-جنوب غرب. بينما يظهر نوع البجماتيت عالى المحتوى الاشعاعى بشكل جيوب و عدسات وأشكال غير منتظمة الشكل ذات أحجام كبيرة تصل لعدة أمتار ويتواجد عند تقاطع اتجاهات شمال شمال شرق-جنوب جنوب غرب و شمال شرق-جنوب غرب مع اتجاه شرق- غرب.وقد بينت الدراسة المجهريية والمعدنية للمكون المعدنى على احتواء كل من أنواع البجماتيت المتمعدن المدروس على نوعية المعادن الاضافية الخاصة به حيث أن نوع البجماتيت ضعيف المحتوى الاشعاعى يحتوى على معادن الذركون والاسفين (التيتانيت) والألانيت. بينما يظهر بنوع البيجماتيت المتوسط المحتوى الاشعاعى معادن اليورانوثورايت والذركون. فى حين يتميز نوع البيجماتيت العالى المحتوى الاشعاعى بتواجد وفرة من المعادن المشعة وهى الاشيوناييت والنوبيواشيوناييت بالاضافة الى معادن الاليمينوروتيل والألانيت واليوراثورايت. ويحتوى معدنى الاشيوناييت والنوبيواشيوناييت على قيمة مرتفعة من اليورانيوم وقيمة متوسطة للثوريوم وذلك مقارنة بالمعادن المشعة المتعرف عليها فى جميع أنواع البيجماتيت المدروسة.