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THE PRESENT SITUATION WITH RESPECT TO THE  
NEW METALS AND MINERALS

(submitted by the Government of United Arab Republic)

THE PRESENT SITUATION WITH RESPECT TO THE  
NEW METALS AND MINERALS

by

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Under article 3 of the explanatory memorandum of the study cycle on some new metals and minerals were mentioned the following:-

beryllium, cesium, colombium, germanium, hafnium, rare-earths, tantalum titanium, yttrium and zirconium.

In the U.A.R. although prospecting work was carried on for a long time and geological, mineralogical, chemical and spectrographical analysis have proved the presence of some of these elements in ores as yet there is no economical exploitation of any of them.

Ilmenite, beryl, black-sands, cassiterite, coal, zircones, monazite are known to occur in the U.A.R. black sands and ilmenite occur in comparatively big quantities; beryl has been known since predynastic time.

To reach the state of economic exploitation there is still an enormous amount of work on methods of prospection, exploitation, extraction and treatment to be carried on.

The status of these metals in U.A.R. as a result of research done by scientists of U.A.R. and others can be summarised in the following:-

Titanium

Titanium is found as ilmenite and titanomagnetite ores.

The ilmenite ore is found in the form of:

- a) Lenticular masses and veins of varying dimensions within the gabbroid rocks belonging to the Precambrian age as in case of Abu Gharqia eastern desert.
- b) Fine sand together with magnetite, rutile, monazite, zircon and garnet in the black sands.

The black sands are near-shore marine deposits which are spread along the whole Egyptian coast of the Mediterranean Sea, from Alexandria to Arish. At present commercial black sands are known at Rosetta.

According to the Egyptian Black Sands Company two localities with an abnormal concentration of Black Sands are encountered there; the western locality about 1.5 km<sup>2</sup> in area and the eastern locality about 4.5 km<sup>2</sup> in area. The mentioned company drilled 104 boreholes reaching up to 20 m. in depth at these 2 localities. The results of sampling these boreholes showed that content of economically valuable minerals in black sands amounts in average to 9% of the total weight of the sands. The reserves of commercial minerals in black sands at the prospected area are approximately 4.6 m.m tons. But the probable reserves of these minerals may be evaluated at more than 40 m.m tons.

The mineralogical composition of the black sands from the enriched part according to the company data is as follows:

Ilmenite 50%, magnetite 20%, zircon 7%, rutile 1.5%, monazite 0.2% and garnet 5%.

The titanomagnetite ore is found as lenticular bodies and veins within the gabbroid rocks of the Precambrian age at Abu Dahr, Wadi Um Efein, and Hamra Dome in the south eastern desert.

Both ilmenite and titanomagnetite are found in big quantities in the previously mentioned localities. The ores contain a reasonable percentage of Ti. The percentage of titanium in the proved ore reserve is:

	Locality	Tons of ore	% TiO <sub>2</sub>	% Ti	Tons of Ti
1	Abu Ghaleq	10,000,000	32.9	19.74	1,974,000
2	Abu Dahr	131,000	16.44	9.86	12,916
3	Wadi Um Efein	not evaluated	7.3	-	-
4	Hamra Dome	30,000	6.35	3.8	1,140
5	Black sands	4,600,000	43.6	26.2	1,205,200
	Total ...				3,193,256

The amount of titanium in the probable ore:

	Locality	Tonnage	% TiO <sub>2</sub>	% Ti	Tonnage of Ti
1	Abu Ghaleq	8,000,000	32.9	19.74	1,579,200
2	Abu Dahr	not evaluated			
3	Wadi Um Efein	---			
4	Hamra Dome	---			
5	Black sands	40,000,000	43.6	26.2	10,480,000
	Total ...				12,059,200

Proved	3,193,256
Probable	12,059,200
Total ...	<u>15,252,456</u>

The Atomic Energy Establishment carried out a detailed field study of the black sands along the Mediterranean Sea coast during the last two years. The results of these studies and evaluation of heavy minerals in these black sands will be available within one year. According to information from Dr. E.M. El-Shazly, Head of the Geological Department of the Atomic Energy Establishment, the preliminary estimation of these black sands along the Mediterranean Sea coast between Rosetta and Arish was found to be 600 million tons.

### Beryllium

Beryllium occurs in the form of  $(\text{Be}_3 \text{Al}_2 \text{Si}_6 \text{O}_{18})$ . The mineral beryl occurs in pegmatitic quartz veins traversing mica and talc schists and occasionally in the schists themselves in the southern part of the Eastern Desert at Zabara, Sikait, Nugurs, Um Kabu, Um Rashid and Um El Diba.

Beryl was exploited by the ancients during pharaonic times. A new mine on the east side of Wadi Sikait was opened about 50 years ago.

A shaft 26.5 deep and a level & Other cross cuts were made to investigate the locality and also many of the ancient stopes and old workings. This was done to explore beryl as gems, but this work proved that the obtained beryls were of poor quality and of little value but this on the other hand may be useful to help to investigate the area as source of beryllium which will be of value if present in sufficient quantity.

The previously mentioned localities where beryl was recorded are localities with investigation for beryllium by modern methods.

### Beryllium in Igla Mine Area

A sample of quartz with cassiterite taken from Igla mine gave 1% beryllium which is considered to be a high percentage. This area is also worth investigation for the said metal.

### Tantalum

The available analyses show that tantalum of comparatively high percentage is present in cassiterite samples of the following localities:

1. Igla cassiterite contains 0.06 % Ta
2. Nuweibi cassiterite contains 1 % Ta
3. El Mueilha cassiterite contains 3 % Ta

The amount of tantalum which can be obtained from the known cassiterite deposits depends on the reserves of the cassiterite and the possibility of the economic exploitation of these areas.

#### Germanium

Germanium was found in minor amounts in Zn ores as well as in coal.

The available analyses shows that the percentage of Ge is comparatively higher in the Pb-Zn ores of Um Gheig, chalcopyrite-sphalerite ore of Um Samiuki and sphalerite-chalcopyrite ore of Abu Gardi. The percentage of Ge in the previously mentioned samples range from 0.001 to 0.003 which can be considered higher than the other samples.

In case the Pb-Zn ore of Um Gheig and the Zn-Cu ore of Um Samiuki are exploited, study tests must be carried out to make use of the germanium found in these ores.

#### Rare Earths and Yttrium

Rare earths namely cerium and lanthanum together with yttrium were recorded in the monazite (Ce, Yt, La)  $P_2 O_5$  together with about an average 5%  $ThO_2$ . The monazite itself is about 0.2% in the black sands.

Chemical analysis by H. Hilal, proved that the percentage of rare earths oxides in monazite mineral is on the average 35%.

According to the estimated amounts of black sands by the Egyptian Mining Co. at Rashid coastal area ( $1\frac{1}{2} \times 1\frac{1}{2} km^2$ ) as 44.6m. tons total proved and probable reserves with this average of 0.2% of monazite in the black sands.

The amount of the monazite in the black sands will be about 88,600 tons:

The amount of cerium	23,129 tons
The amount of lanthanum	22,927 tons
The amount of yttrium	14,670 tons

Zirconium

Zirconium can be obtained from zircon  $Zr SiO_4$  which is found in the black sands as 0.7% on the average taking the estimated amounts of the proved and probable black sands to be 44,600,000 tons and the percentage of zircon to be 0.7%.

The total amount of zircon will accordingly be 312,200 tons.  
Therefore the amount of zirconium will be 155,381 tons.

At the present state all the above mentioned new metals and minerals have not been exploited on a commercial scale with the exception of some other products of the black sands such as magnetite and monazite.

Much prospection is still required to develop and prove the ores and research on the treatment, extraction and exploitation of them is needed.

