

## 5. SUMMARY

Shale deposits are the most common and abundant sediments in the lithosphere. National reserve of these deposits are estimated as about 11 billion ton. The current investigation was conducted to achieve the following objectives:

a-Identifying the chemical and mineralogical characteristics of shale deposits of Abo-Thor area, south west Sinai peninsula b-improving the status of the studied shale deposit concentrations of some toxic ions,i.e., U, Cu and Zn present in it.

To fulfill the aimed purposes, leaching of the used shale deposit sample was conducted using  $\text{H}_2\text{SO}_4$  at different concentrations of 2 and 5% and different solid : liquid ratios, i.e., 1:1, 1:2, 1:3 .  
The most important results called be summarized in the following :

- X- ray diffraction pattern of the clay fraction of the sample revealed the dominance of kaolinite mineral followed by hydrous mica (illite) while the accessory minerals were dominated by quartz.
- The major oxides of  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{MgO}$ ,  $\text{CaO}$ ,  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{P}_2\text{O}_5$  were 27.5, 11.7, 18.2, 0.22, 13.3, 4.9, 2.2, 1.4 and 0.4%, respectively. The values of  $\text{Al}_2\text{O}_3$  and  $\text{Fe}_2\text{O}_3$  may be indicated that the studied shale have, in general, emphasized the pronounced contents of kaolinite and a ferruginous nature.
- Trace and radioactive elements analysis revealed that, uranium, copper and zinc were recorded percentage values of the most dominating elements in the studied shale sample, where their total contents were 167, 6160.25 and 3826.25  $\text{mg/kg}^{-1}$ , respectively.
- The EC was excessively high (38.2  $\text{dSm}^{-1}$ ), the soluble cations were

dominated by  $\text{Na}^+$  and  $\text{Mg}^{2+}$ , while the soluble anions were dominated by  $\text{Cl}^-$ .

- The textural class of the investigated shale sample was a sandy clay loam of about 17.25% clay, 24.95% silt and 57.8% sand.
- The highest leachability (leaching efficiency) of uranium reached 86 and 83% of its total content in shale deposit sample under acid concentrations of 2 and 5%, respectively, as well as a solid liquid ratio of 1:3, confirming the superiority of the relatively low  $\text{H}_2\text{SO}_4$  concentration (2%).
- The highest leachability (leaching efficiency) of both copper and Zinc reached 84.21 and 55.01%, respectively, of their total contents in shale deposit sample under an acid concentration of 5% and a solid : liquid ratio of 1:3.
- The leaching process caused a pronounced decrease for each of EC, pH and soluble ions to a magnitude depends on both acid concentration and solid:liquid ratio.
- Increasing the acid concentration and solid:liquid ratio resulted in decreasing the percentage of both kaolinite and illite minerals vs an increase in the percentage quartz mineral due to its resistance to weather.

Thus, the aforementioned results indicate that the investigated shale deposit could be more suitable for industrial purposes such as civil engineering works.