Preparation of Uranium Concentrate from Crude Yellow Cake

By

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M. Sc. Chemistry 2007

For the Degree of Doctor of Philosophy (Ph. D.) in Chemistry

A Thesis Presented

To Chemistry Dept., Faculty of science

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Dedication

To

My late father, who unfortunately
did not stay in this world long
enough to see his son become
a doctor

To

My mother

To

My wife and my sons

To

All my family

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Ahmed Aly Abdel Samad Esmail

ABSTRACT

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The studied area, Abu-Rushied, is located between longitude 34^{o} 46` to $34^{o}$ 46` 35`` E and latitude $24^{o}$ 37` 16`` to 24^{o} 38` N, South Eastern Desert, Egypt. The main rock units of Abu Rushied area from the mineralogical point of view are the cataclastic group and the lamprophyre dykes cutting through it.

The main aim of this work is to develop a selected process to purify uranium from its mineral ores concentrate, to reach international standard yellow cake. the present thesis is directed to investigate, the following;

1- Study a suitable leaching reagent of uranium for Abu Rushied ore.
2- Assess the kinetics model for leaching of working ore.
3- Investigation of uranium extraction by TOA from sulfate medium.
4- Investigation of uranium extraction by dynamic ion exchange from sulfate medium.

Different parameters affecting the leaching of uranium from its ore using carbonate, sulfate, and nitrate solutions were studied. Parameters affecting the leaching efficiency are grain size, leaching reagents concentration, solid to liquid ratio, agitation time, temperature, and adding oxidizing agent if necessary.

It is found that leaching by nitric acid is more convenient than carbonate or sulfuric acid leaching in terms of efficiency of uranium recovery, low iron concentration as well as agitation period.

The leaching process was be well described by the shrinking core model, and the rate controlling step for the uranium leaching from Abu Rushied ore is the inner diffusion of chemical reagent.