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بسم الله الرحمن الرحيم

HOSSAM MAGHRABY

شبكة المعلومات الجامعية

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

HOSSAM MAGHRABY

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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FACULTY OF SCIENCE
AIN SHAMS UNIVERSITY

Phyco-Sorption of Uranium from its Different Processing Effluents

Thesis
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Dedication to
my father's
& mother's souls

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ABSTRACT

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Heba Mohamed Abdel Hakam Mahdy. Phyco-Sorption of Uranium from its Different Processing Effluents

This work is a good and promising trial for the removal and recovery of uranium using one of the most effective eco-friendly techniques. It concerned with studying the ability of some Egyptian algal taxa to adsorb uranium from its processing effluents such as the waste of Gattar pilot plant. Moreover, removing of some heavy metals in order to recycle this waste as a solution of water shortage was performed. Nine algal taxa were collected from Egyptian sea shores representing the three major divisions of algae (brown, red and green) namely ***Sargassum latifolium*** (Turner) C. Agardh, ***Padina pavonica*** (Linnaeus) Thivy, ***Dictyota dichotoma*** (var.) *intricata* (C. Agardh) Greville, ***Jania adhaerens*** J.V. Lamouroux, ***Amphiroa compressa*** M.Lemoine, ***Galaxaura elongate*** J. Agardh, ***Ulva lactuca*** Linnaeus***, Codium vermilara*** (Olivi) Delle Chiaje***, Coulerpa racemosa*** **(**var.) *lamourouxii* f. *requienii* (Montagne) Weber-van Bosse, as a marine algae in addition to one fresh water alga ***Cladophora glomerata*** (var.) crassior (C. Agardh) Hoek collected from River Nile**.**

Firstly, this work interested by studying the factors affecting the biosorption process to achieve the maximum biosorption capacities of uranium. Many factors were displayed such as contact time, pH, initial feed concentration, solid/liquid ratio and temperature. The observed data clarified that the highest significantly results of biosorption were 190, 177, and 170 mg/g for ***Sargassum latifolium*****,** ***Padina pavonica*** and ***Dictyota dichotoma***, respectively as brown algae. For green algae were 190, 185, 150 and 110 mg/g for ***Cladophora glomerata, Ulva lactuca***, ***Coulerpa racemosa,*** and ***Codium vermilara*** respectively. And 173, 155 and 110 mg/g for ***Jania adhaerens,***

Amphiroa compressa and ***Galaxaura elongate***, respectively (red algae) at 1 h contact time, 1/1000 S:L ratio, 200 ppm uranium as initial concentration at pH 4 in the room temperature for the ten used genera of algal biomasses. Therefore the most efficient algal masses for uranium adsorption from each division were ***Sargassum latifolium***, ***Cladophora glomerata, Ulva lactuca***, and ***Jania adhaerens.***

Then, the study throws the light on the characterization of the algal biomasses by FTIR to distinguish the contributing groups in this process which were variable and envolved several mechanisms depending on uranium concentration and algal type. Also, SEM analysis to study the morphological features and surface characteristics, a final step of characterization was some phycochemical screening of the most efficient algal masses which carried out to investigate the main constituents of algal masses and their effect on the biosorption reaction mechanism i.e (the phytochelators).

Desorption study of the loaded uranium on the algal biomasses was achieved by HCl which gave its higher efficiencies at 95.3, 94.9 %, 90.3, 80.4 and for ***Sargassum latifolium***, ***Cladophora glomerata, Ulva lactuca***, and ***Jania adhaerens*** respectively at contact time 10 min and 0.1M eluent concentration. However, the minimum elution efficiencies were obtained by EDTA solution (18.5, 18.5 %, 16.57, and 11.5) for ***Sargassum latifolium***, ***Cladophora glomerata, Ulva lactuca***, and ***Jania adhaerens*** respectively.

The most effective algal masses from each division were applied to treat Gattar's pilot plant waste solution (Uranium effluent). It was concluded that uranium uptake starts after two cycles with efficiencies reaches to 90, 90, 88.4, and 85 % for

Sargassum latifolium, ***Jania adhaerens, Cladophora glomerata,*** and ***Ulva lactuca***, respectively under the concluded optimum conditions. Meanwhile, most of other harmful and competitive elements as heavy metals and sulfates were adsorbed in the first two cycles. Finally, about 99 % of the loaded uranium was eluted using optimum elution conditions illustrated before, while the other elements such as iron, calcium, zinc, copper,…etc were eluted using 0.1M EDTA leaving the waste effluent solution suitable for recycling purpose. The algal biomasses were washed with water and can be reused again.

Key words: Uranium biosorption, Desorption; Fresh and marine algae*:* Gattar; effluents.

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