قال تعالى:


صدق الله العظيم

سورة العلق الآيات من (1-5)
Dedication

To the ones whom I care much for
To my parents
To the one who gave me faith, strength, pleasure
Love just by being there
To you
To the ones who contributed to my well being
To my colleagues
With love.
Acknowledgements

Great thanks and gratitude are forwarded to my main supervisor **Prof. Mohammed Talballa El-Sheikh** for his valuable advice and guidance through the various stages of this project, in planning, implementing and concluding the research. In the same vein thanks are extended to co-supervisor, **Dr. Abdelsalam Abdallah. Dafalla**, and without mincing of words as many thanks to **Dr. Hassan Abdurrahman. Fatah** of Khartoum University, Faculty of Chemical Engineering. Thanks are also extended to **Mr. Adel Ali** and **Mr. Tarig Abdelrahman** of Petrodar Company. Special thanks to **Mr. Omar Elbadawy** in Khartoum University’s Central Laborarory. Special thanks are extended to **Mr. Mohammed Ali Idris** and **Mr. Omar Babiker** of the Central Petroleum
Laboratories (C.P.L). Thanks are extended to whomever in wherever hereby contributed in the bringing up and in the completion of this research.

Thanks everybody.
Abstract
(English)

Zeolite samples were collected from Wadkawly in Gadarif region. These samples were characterized with respect to both physical and chemical properties. X-ray Diffraction Analysis (XRD) showed these samples to be composed of Thomsonite zeolite, exclusively. The samples were treated with strong brine solution to ensure that Na-zeolite is generated and used as the stationary ion exchange phase. Solutions containing 100ppm of the ions (Pb$^{2+}$ or Fe$^{3+}$ or Ni$^{2+}$) were artificially prepared, then processed with the zeolite. Excellent extraction was achieved, with final residual concentration of 0.02 ppb, 3.0 ppb and 1.38 ppm for (Pb$^{2+}$, Fe$^{3+}$ and Ni$^{2+}$) respectively. This gives extraction efficiency of ~ 100 %, 99.9 %, and 98.6 %, for Pb$^{2+}$, Fe$^{3+}$ and Ni$^{2+}$, respectively. The relative efficiency is, therefore:

$$\text{Pb}^{2+} > \text{Fe}^{3+} > \text{Ni}^{2+}.$$
الخلاصة

جمعت عينات من الزيوليت من ود كولي في منطقة القضارف. أجريت دراسة للخصائص الفيزيائية والكيميائية لهذه العينات. وقد بين التحليل بحيد الأشعة السينية أن هذه العينات تنتمي حصراً إلى فصيلة الزيوليت المعروفة "بالتمسوونيت". وجرت معالجة العينات بحلول الملح المركز للتأكد من أنتاج زبوليت الصوديوم (Na-Zeolite) الذي وظف كالطور الثابت في عملية التبادل الأيوني. وتم تحضير محاليل من الأيونات (Fe³⁺, Pb²⁺) ثم عولجت بالزيوليت. وجد أن استخلاص هذه الأيونات تحقق بدرجة ممتازة، معطياً تراكيز نهائية هي 0.02 جزء من مليون لـ Fe³⁺ و 0.02 جزء من مليون لـ Pb²⁺ و 3.0 جزء من مليون و 1.38 جزء من مليون للأيونات (Ni²⁺ و Pb²⁺) على التوالي. ويعطي هذا فعالية استخلاص ~100%, 98.6% و 99.9% للأيونات (Ni²⁺ و Pb²⁺) على التوالي. ومن ثم فإن الفعالية النسبية للاستخلاص هي:

\[ \text{Pb}^{2+} > \text{Fe}^{3+} > \text{Ni}^{2+} \]
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