ABSTRACT

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The use of living plants and /or non-living plants biomasses is an attractive option for the treatment of industrial wastewater and removal of a large number of different contaminants in an environmental friendly way. In the first part of this study, wastewater, sediment and *Typha domingensis* plant samples were collected from the industrial zone at El-Sadat city in Egypt. Samples analyses revealed that wastewater samples contained aluminium, iron, zinc and lead ions with concentrations exceeding the permissible limits set by the Egyptian environmental laws. It has been found that *Typha domingensis* growing in the study area was capable of accumulating the studied metal ions preferentially from water than from sediments. The accumulation of metals by plant was restricted to its roots as the translocation factor was less than unity. Rhizofiltration was found to be the best mechanism to explain *Typha* phytoremediation capability. In the second part of the study, the effectiveness of *Typha domingensis* leaf powder for simultaneous removal of Al, Fe, Zn and Pb from aqueous solution was assessed. Batch experiments were carried out. The sorption process was found to be best described by the second order rate kinetics. The applicability of three equilibrium isotherm's models was investigated and was found to follow the following order: Langmuir > Freundlich >Temkin, for all the studied metal ions. A full 2^3 factorial design was then employed to obtain the best conditions of biosorption. Three factors were screened namely: temperature, pH, and biosorbent dosage. The factors were varied at two levels for each. The effects of each factor as well as the interaction effects of the factors on the biosorption process were obtained. The pH was found to be the most significant factor for the metal ions uptake. The infrared spectra of native and exhausted *Typha* leaf powder confirmed ions-biomass interactions responsible for sorption. Scanning electron micrographs confirmed the porous nature of the biosorbent surface.

Keywords: Sadat city; *Typha domingensis*; bioconcentration factor; translocation factor; aluminium; iron; zinc; lead; rhizofiltration; biosorption; kinetics; equilibrium isotherms; factorial experimental design; elemental analysis; infrared spectra; scanning electron microscopy.

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كليه العلوم- قسم الكيمياء

الدراســـات العليـــــا والبحوث

مستخلص

الاســـم: غدير علي فؤاد الشغبي

عنوان الرسالة: دراسات عن المعالجة الكيميائية و النباتية لمياه الصرف الصناعي

الدرجـــــة: دكتوراه الفلسفة في العلوم (كيمياء تحليلية)

ملخص البحث: تم عمل دراسة من جزئين لمعرفة جدوى استخدام النبات أو مسحوق أوراق النبات في معالجة مياه الصرف الصناعي. في الجزء الأول من الدراسةِ، تم تجميع عينات من مياه الصرف، و التربة وعينات نباتِ Typha domingensis مِنْ المنطقة الصناعيةِ في مدينةِ السادات في مصر. كَشفتْ تحليلاتَ العيناتِ بأنّ عيناتِ مياه الصرف إحتوتْ على ألمنيوم، حديد، وزنك و رصاص بنسب تَتجاوزُ الحدودَ المسموح بها مِنْ قِبَلْ القوانينَ البيئية المصرية. كما وُجِدَ ان نبات Typha domingensis النامي في منطقةِ الدراسة كَانَ قادرة على تَجميع الآيوناتِ المعدنيةِ محل الدراسة بشكل تفضيلي مِنْ الماءِ عنه من التربة. وفي الجزء الثاني للدراسةِ، تم تقيُيّمَ فعالية مسحوق اوراق نبات Typha domingensis لإزالةِ ايونات الالمونيوم و الحديد و الزنك و الرصاص مِنْ محلولهم . تم استخدام طريقة الـ factorial design للحُصُول على أفضل شروط عملية الامتزاز و قد تمت دراسة ثلاثة عوامل بمستويين و هي: درجة الحرارة و الاس الهيدروجيني و وزن المادة (اوراق النبات). و قد تبين ان الاس الهيدروجيني هو العاملَ الأهمَّ و الاكثر تأثيراً على عملية امتزاز الايونات محل الدراسة.

الكلمات الدالة: (1) مياه الصرف، (2) الالمونيوم، (3) الحديد، (4) الزنك، (5) الرصاص، (6) الامتزاز (7) الاس الهيدروجيني، (8) الحرارة، (9) الوزن، (10) ميكروسكوب الماسح الالكتروني .

" توقيع السادة المشرفين"

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كلية العلوم –جامعة القاهرة

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