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PREPARATION OF DIRECT ACTIVATED CARBON FROM TYPHA DOMINGENSIS IN AL-DALMAGE MARSH

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Abstract

Analysing quality of surface water in marshlands is very important due to considered especially of tourism resources and protectorates. The current study used of a live and non-live powder from *Typha domingensis* plant to remove or reduce Pb concentration from soil and water in eight main stations from Al-Dalmage marshes between Qadisiyah and Wasit Iraqi Governorate. The experiments were carried out lead concentration before and after the natural treatment incineration and the conversion of the plant to the coal powder to study and determine the ability to remove this element with different sizes of plant powder (500, 1000, 1500 and 2000) micrometres. The results showed that the optimum size of papyrus powder was 1000 ìm. At different rates (0.5, 1, 1.5 and 2) ml / min, the optimum flow rate was 1 mL/min. The results showed that the concentration of 100 ppm is the ideal concentration of the adsorption process. The lead removal percentages were (94.08, 95.57%) soil, water, respectively. the plant dried and carbonized at 400^0C the corresponding was 63.6% optimum conditions for the activated carbon production was evaluated based on the determination of various adsorption parameters of methylene blue as the adsorbent with maximum wavelength about (660nm) and temperature for activating PH 7.9 and KOH were 500^0C and 350^0C and time 1 minute and 10 minutes, respectively. The last step was to re-examine the adsorption treatment models. The absence of the lead element was completely observed from soil, water samples.

Key words : Marsh, Lead (Pb), activation, carbonization, *Typha domingensis*.

Introduction

Possess activated carbon a highly developed pore structure for the removal of pollutants such as gases or elements, liquids and used as a recovery and purification of component chemicals because properties of it activated depend on the nature of activation process and source materials (Sekirifa *et al*., 2014). Can be considered the activated carbons are carbonaceous materials to distinguished from elemental such as Lead, Mercury, Zinc, Cadmium and copper by the oxidation the carbon atoms on the inner and outer surfaces and extraordinary in surface areas (Al-Qodah and Shawabkah, 2016; Foo and Lee, 2010). *Typha domingensis* consider a herbaceous perennial plant and growing from a fast spreading rootstock in all year round. A very wide range of modern and traditional and medicinal applications. Also consider a protector of the soil and water in wetland and a productive source of biomass in ecosystem (Abdel-Ghani *et al*., 2009).

For removing pollution from aquatic ecosystems used many techniques such as incomplete metal removal and a high reagent, energy requirements and generation of toxic sludge or agriculture (Chandra *et al*., 2003). Different studied were investigated for metals removal such as Abdel-Ghani *et al*. (2009), Horsfall *et al*. (2006; Singh *et al*. (2005), Zafar *et al*. (2007).

Natural purification of water in liquid form depends on chemical absorption and adsorption by soil particles and organic matter, living organism uptake of nutrients, and living organism decomposition processes in soil and water environments. Heavy metal initial concentration is apparently affecting the biosorption process (Yuh-Shan and Mckay, 1999). It seems to be crucial for identifying the maximum saturation potential of the biosorbent materials that the work should be conducted at the higher concentrations of heavy metals in aqueous solution (Qaiser *et al*., 2009; Witek-Krowiak *et al*., 2011). Activated

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carbon is obtained through the controlled burning with a low level of oxygen of porous materials such as corn cobs, wood, coconut husks and rice husks due to its negative characteristics, resistance to degradation, the great volume occupied, low nutritive properties and high level of ash (Harima *et al*., 1997). This research used easy innovative treatment techniques and focused attention on the use of biological materials for active carbon of a plant *Typha domingensis* to reduce lead (Pb) and try to remove and recovery due to good performance and low cost of this completing element and used a filtration material before and after carbonization.

Methodology

Samples locations

Eight basic stations were chosen in this study in the Al-Dalmage marshes. It was chosen three main sites of the (start, middle and end) of each region for the purpose of study and labeled it depending coordinates these locations were determined by the (GPS/ Geko 201, Taiwan) (table 1).

Sample collection

Water samples : The water samples were collected from the surface water (about 30 cm below the surface) in each community, using 48 litter containers. Water samples (sub-surface) were collected by means of a Van Dorn water sampler. The water samples were immediately filtered through 0.45µ Millipore filters. The filtrates were placed in glass containers and were divided into two parts for pre-treatment and post-treatment. Standard methods by Pearson and Havill (1988) (24 before and 24 after) one sample three replicate total water 48.

Soil sampler : The soil samples were collected by using cleaned polyethylene bags from 30 cm in depth, Soil samples were separated for two parts examination of Lead before and after treatment (24 before and 24 after) one sample three replicate total 48.

Aquatic plants : Basic species of aquatic plants were chosen *Typha domengensis* (Class: Angiosperm, Family: Typhaceae) (Linnaeus, 1758). *Typha domingensis* were collected into two parts same sites, first part was cleaned put in polyethylene bags then rinsed thoroughly with deionized water and dried in the outdoor in room temperature for 3-5 days and grind well with a ceramic mortar and use a manual sieve 2 mm to get rid of impurities and be ready before analysis, second part in same sites. It was burned in field until it became ash. 24 before, 8 after total 32.

Carbonization preparation

After washed plants with distilled water to remove dirt, dust and impurities from the surfaces from leaflets in 30 minutes with burning and high temperature. The resulting black mixture was left to cool and then used KOH with deionized water several times and transferred to lab. Finally stored in a dry, clean and well-closed polyethylene jar to use next time (Gimba *et al*., 2001).

Laboratory analysis

Sample Preparation analysis by Topwave analytic Jena type

Samples soil (n = 48) plants (n= 24 and 8 samples ash) were solute by weigh 0.3 g in the digestion vessel, add 5ml of nitric acid HNO_3 65% after that shake the mixture carefully and wait at least 10min before the vessel is closed. Heat in the Microwave oven with the following program to avoid foaming and splashing wait until the vessels have cooled same room temperature about (10min), carefully open the digestion vessel in fume hood wearing hand Eye and body protection since a large amount of gas will be produced during the digestion process, then were quantitatively transferred to a Falcon tubes and diluted to 15 ml with deionized water. For the quality control analysis, 0.250 g of NIST SRM 1846 (plant powder formula) was transferred into a Teflon vessel, reconstituted with 2 mL of deionized water. For all samples digestions, five replicates were performed .Also calibration blanks of 2.0 mL deionized water were taken through the same digestion process. The detection limits (LOD) for each element in this study were calculated based on three times the standard deviation of the average of 5 blank measurements to one test. Depending methods of Ataro *et al*. (2008) and Nascimento *et al*. (2008) to complete digestion was obtained. The arrival of a new microwave system fostered further optimization of the sample digestion method.

Parameters tests of soil

pH, conductivity, TDS, color, turbidity, hardness : Values of a suspended solution from the soil. Prepare the suspended solution from the soil by taking 50 g of the sample of the previously dehydrated and dehydrated soil. Add 50 mL distilled water. Mix the solution well and leave for 30 minutes stirring every few minutes. After leaving the solution suspended for a full hour, after the expiration of the full hour was well blended and was measured pH (ICARDA (2002). The method of Gimba *et al*. (2001) was used to determine the minimum temperature for carbonization of the *Typha domingensis*. 20 g of sample was weighed in a clean crucible and heated in a muffle furnace at temperature ranging from 20^0C to 50^0C for

10 minutes, after that characterization of the carbonized carbon were determined moisture, dry matter content, ash content, bulk density, temperature, concentration, time, particle size and time.

Statistical analysis

Statistical analysis of the Pb results was performed using one-way analysis of variance. Test of equality of variance showed equal variance ($p>0.05$), linear regression analysis was used to determine any significant correlations between carbon and Hg in soil concentrations.

Results and Discussion

The observed results of the parameters of the soil tests were determined by characterization of carbonized carbonated moisture, dry matter content, ash content, pH, conductivity, TDS, color, turbidity, hardness values of a suspended solution from the soil as shown in table 2.

Through the results obtained we observe a clear reduction in lead concentrations synchronized with biochemical factors and acidity before and after carbonation there is a weight loss upon with increasing the temperature of the carbonization. Probably during carbonization at the higher temperature, water is released associated with hydrogen bonds; this implies that a correlation could exist between late matters or groups and the weight loss during carbonization at various temperatures. Conversion of char carbon to CO or CO_2 in presence of oxygen, thus decreasing the weight of carbon at equilibrium with activation temperature and time, after activation were determined about 50^0C for plant carbon, leave it on the plant, water and soil for two days and re-examine the lead again with the rest of the physical and chemical factors the carbonized to show that the activation was actually successful when compared to the carbonized before an analysis that was not activated. At an initial concentration of ppm, it is observed that the plant carbon activated adsorbed 94.08% from soil to plant and these competed very well with the commercial activated carbon from soil, which has water to plant 95.57% that lower values, but with water concentration and could be developed into activated carbon having very high efficiency for any elements.

Table 1 : The coordination of the study stations.

Local name	E	N	Station	
Hill of Archeology	45º29'06.0"	32º14'18.9"	S1	1
	45º29'10.1"	32º14'00.4"	S2	2
Ancient Dam	45º33'09.2"	32º13'30.8"	S3	3
	45º32'14.2"	32º13'34.5"	S4	4
Qasim Fisher	45º31'35.0"	32º13'45.2"	S5	5
	45º29'44.1"	32º15'24.4"	S6	6
	45º29'09.4"	32º15'54.1"	S7	7
	45º28'56.9"	32º16'16.0"	S8	8

Table 2 : Parameters of the soil tests.

Parameters	Unit	Before filtration	After filtration	National standards WHO2006
pH	-	6.99	8.01	6.0-9.0
Conductivity	uS	780	793	1000
TDS	ppm	476	479	1000
Color	Pt/Co	>550	13	15
Turbidity	NTU	39	14	5
Hardness	mg/L	82	72	500

Table 3 : Concentration Pb in soil, water and *Typha domingensis* before carbonization.

Station	Soil (mg kg^{-1})	Water (μgL^{-1})	*Typha domingensis* (mg kg^{-1})
S1	45.4	1.76	3.82
S2	42.29	1.56	4.95
S3	33.94	1.93	3.94
S4	29.49	2	4.94
S5	22.83	1.83	4.99
S6	45.03	0.99	3.84
S7	38.94	1.82	3.65
S8	31.04	2.91	4.05
Mean	36.12	1.85	4.27
SD	7.6	0.49	0.5
P value	0.03	0.01	0.01

Table 4 : Concentration Pb in soil, water and *Typha domingensis* after carbonization.

Station	Ash *Typha domingensis* (mg kg^{-1})	Soil (mg kg^{-1})	Water (μgL^{-1})
S1	0.04	1.3	1.01
S2	0.01	1.6	1.02
S3	0.02	2.93	1.71
S4	0.04	0.43	1.27
S5	0.04	1.9	1.01
S6	0.05	1.01	0.26
S7	0.01	1.93	1
S8	0.02	0.92	1.72
Mean	0.03	1.5	1.3
SD	0.01	0.7	0.4
P value	0.001	0.02	0.01

The chemistry of carbonization is immensely complex, it involves too many chemical reactions, some occurring simultaneously. The environmental question, with the necessity of minimizing the global emissions of CO_2, is a favorable point for the use of biomass, since when this is burned, CO_2 is released into the atmosphere; however, the plants absorb this gas during their photosynthesis.

Test of equality of variance showed equal variance ($p>0.05$), linear regression analysis was used to determine any significant correlations between carbon and Pb in soil concentrations with plants before and after carbonized carbonated moisture.

Conclusion

According to our results, it will not be possible to know in detail of carbonization an attempt has been made in this work to study depending on the minimum and optimum carbonization temperature and time. For economic reasons and to avoid further pollution of the environment with the used adsorbent different plant .Regeneration study was carried out on both the prepared natural it was found out that the adsorbent could be actually be regenerated refresh environmental factor without any chemical interaction.

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References

Al-Qodah, Z. and Shawabkah, R. Onsecaa and Eliseo Amado Gonzáleza (2016). Production and characterization of granular activated carbon from activated sludge. *Chemical Engineering Transactions*, **50**, 2016 , **26**(01) : 127 - 136, January - March, 2009.

Abdel-Ghani, N. T., A. K. Hegazy and G. A. El-Chaghaby (2009). Typha domingensis leaf powder for decontamination of aluminium, iron, zinc and lead: Biosorption kinetics and equilibrium modeling. *Int. J. Environ. Sci. Tech*., **6(2)** : 243-248, ISSN: 1735-147.

Ataro, A., R. I. McCrindle, B. M. Botha, C. M. E. McCrindle and P. P. Ndibewu (2008). Quantification of trace elements in raw cow's milk by inductively coupled plasma mass spectrometry (ICP-MS). *Food Chem*., **111(1)** : 243-248.

Chandra, S. K., C. T. Kamala, N. S. Chary and Y. Anjaneyulu (2003). Removal of heavy metals using a plant biomass with reference to environmental control. *Int. J. Miner. Proc*., **68 (1-2)** : 37-45.

Foo P. Y. L. and L. Y. Lee (2010). Preparation of Activated Carbon from Parkia Speciosa Pod by Chemical Activation. *Proceedings of the World Congress on Engineering and Computer Science*, **II** : 20-22.

Gimba, C. E., J. Y. Olayemi, S. T. Okunnu and J. A. Kagbu (2001). 'Adsorption of Methylene Blue by Activated carbon from Coconut Shell. *Global Journal of Pure and Applied Sciences*, **7(2)** : 265-267.

Harima, E. (1997). Dissertação de mestrado. São Paulo: Universidade de São Paulo, Brazil, 1997, Available online: http://www.teses.usp.br/teses/disponiveis/88/88131/tde-25112 014-160127/en.php (accessed on 10.12.2015).

Ho, Yuh-Shan and Mckay Gordon (1999). Pseudo-Second Order Model for Sorption Process. *Process Biochemistry*, **34** : 451-465.

Horsfall, M. J., F. E. Ogban and E. E. Akporhonor (2006). Recovery of lead and cadmium ions from metal-loaded biomass of wild cocoyam (*Caladium bicolor*) using acidic, basic and neutral eluent solutions. *Electron. J. Biotech*., **9(2)** : 152- 156.

ICARDA (2002). ICARDA Annual Report 2001. International Center for Agricultural Research in the Dry Areas, Aleppo, Syria.112 pp.Sekirifa Mohamed Lamine, Cherraye Ridha, Hadj-Mahammed Mahfoud, Chenine Mouad, Baameur Lotfi and Ammar H. Al-Dujailib (2014). Chemical activation of an Activated carbon Prepared from coffee residue. Elsevier, pp.393–400.

Nascimento, E. A., R. Chang, SAL Morais, D. Piló-Veloso and D. C. Reis (2008). Um marcadorquímico de fácildetecçãopara a própolis de alecrim-do-campo (*Baccharisdra cunculifolia*). *Rev Bras Farmacogn*, **18** : 379-383.

Pearson, J. and D. C. Havill (1988). The Effect of Hypoxia and Sulphide on Culture-Grown Wetland and non- Wetland Plants. Growth and nutrient uptake. *Journal of Experimental Botany*, **39** : 363-374.

Qaiser, S., A. R. Saleemi and M. Umar (2009). Biosorption of lead (II) and chromium(VI) on groundnut hull: Equilibrium, kinetics and thermodynamics study. Vol. **12** No.4, October 15.

Singh, K. K., R. Rastogi and S. H. Hasan (2005). Removal of cadmium from wastewater using agricultural waste rice polish. *J. Hazard. Mater*., **121 (1-3)** : 51-58.

Witek-Krowiak, Anna, Szafran, Roman and Modelski Szymon (2011). Biosorption of Heavy Metals From Aqueous Solutions Onto Peanut Shell as a Low-Cost Biosorbent. *Desalination*, **265** : 126-134. 10.1016/j.desal.2010.07.042.

Zafar, M. N., R. Nadeem and M. A. Hanif (2007). Biosorption of nickel from protonated rice bran. *J. Hazard. Mater*., **143 (1- 2)** : 478–485.