LAMPIRAN

1. Tangkap Layar Jurnal "Biosorpsi Timbal Oleh Biomassa Daun Ketapang"

BIOSORPSI TIMBAL OLEH BIOMASSA DAUN KETAPANG

LEAD BIOSORPTION USING BIOMASS FROM KETAPANG LEAF

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ABSTRAK

Limbah yang mengandung logam berat timbal (Pb) sangat berbahaya bagi lingkungan. Proses pengolahan telah diperkenalkan untuk mengolah limbah, dari proses pengendapan, hingga menggunakan resin penukar ion. Daun ketapang telah di gunakan sebagai media pengolahan air yang digunakan untuk akuarium. Para peneliti telah menunjukkan daun ketapang berpotensi sebagai pengolah air limbah. Penelitian ini bertujuan untuk mengetahui potensi biosorpsi daun ketapang pada limbah yang tercemar logam berbahaya, dengan mempelajari karakteristik biosorpsi, kesetimbangan, kinetika dan termodinamika. Kondisi optimum seperti pH, dosis daun ketapang, waktu kontak dan suhu akan diamati pada penelitian ini. Hasil Penelitian biomassa daun ketapang berpotensi sebagai biosorben, dengan perlakuan asam atau basa daun ketapang ini masih berpotensi sebagai biosorben. Penyerapan sangat dipengaruhi oleh pH, konsentrasi ion Pb, massa adsorben, waktu kontak dan suhu, yang berurutan nilai maksimum nya adalah pH 3, konsentrasi ion Pb 5 mg/L, massa adsorben 0,5 gram, waktu kontak 4 jam, dan suhu 40 ºC. Laju reaksi berjalan pada orde satu dan memenuhi kaidah isotermal Langmuir. Daun ketapang memiliki energi aktivasi yang rendah sehingga cocok untuk dijadikan adsorben alternatif penyerapan logam Pb dari limbah yang mengandung logam Pb.

Kata kunci: Adsorpsi, daun ketapang, timbal (Pb)

ABSTRACT

Waste containing of lead (Pb) is very dangerous for the environment. However, waste treatment process has been introduced to minimize the waste, either by precipitation process or ionic exchange resin. In addition, researchers have shown that ketapang leaves (*Terminalia catappa*) can be potentially used in waste water treatment. It has been used as water treatment media for fresh water aquarium. Moreover, this research was aimed to find out the potential of ketapang leaves biosorption for waste treatment that has been polluted by heavy metal, such as lead, by investigating the characteristics of biosorption, kinetics and thermodynamics. Maximum conditions of pH, ketapang leaves dose, contact time, and temperature were also investigated in this research. The result showed that biomass of ketapang leaves has potential as biosorbent. Nevertheless, the absorbtion was highly affected by dependent to pH, Pb concentration, adsorbent mass, contact time, and temperature, in which the maximum limits are 3; 5 mg/L; 0.5 gram; 4 hours; 40 ºC; respectively. Reaction rate, moreover, was running

2. Tangkap Layar Jurnal "Pengaruh Aktivasi Kimia Arang Tanaman Eceng Gondok *(Eichhornia crassipes)* Terhadap Adsorpsi Logam Timbal (Pb)"

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PENGARUH AKTIVASI KIMIA ARANG TANAMAN ECENG GONDOK (*Eichhornia crassipes*) TERHADAP ADSORPSI LOGAM TIMBAL (Pb)

Chemical Activation Effect of Water Hyacinth Plant (*Eichhornia crassipes*) Charcoal on Adsorption of Lead (Pb) Metal

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Abstract

This study aimed to determine the optimum pH and the optimum weight of charcoal and activated charcoal from water hyacinth in adsorbing the lead (Pb)metals. Determination of adsorbed metal content in the charcoal and the activated charcoal was measured using a spectrophotometer spectrodirect. Activated water hyacinth charcoal was prepared by carbonization in furnace at a temperature of 300 0C in low oxygen levels. Thenthe carbon wasactivated by adding $ZnCl_2$10%, soaked for 24 hours, filtered andplaced in the oven at a temperature of 105°C for 1 hour. The optimum pH was determined by mixing Pb^{2+} with water hyacinth (eichhornia crassipes) charcoal at various pH of 3; 4; 5; 6; 7 and 8. The results indicated the optimum pH of charcoal and activated charcoal to adsorb metals was 5 with the percentages of lead absorbed were 90.34% and 98.67%, respectively.While the weight of charcoal varied by 25, 50, 75, 100 and 125 mg, the optimum weight of activated charcoal was 100 mg with lead absorbed by 98.44%. The results showed that the water hyacinth charcoal and activated charcoal performedexcellent ability to adsorb lead metal.

Keywords: *Water hyacinth (eichhornia crassipes); Activated charcoal; Pb content; adsorption of lead; spectrophotometerspectrodirect.*

Pendahuluan

Seiring berkembangnya industri dalam negeri, tidak hanya menimbulkan dampak positif bagi masyarakat, melainkan juga dampak negatif bagi lingkungan yaitu semakin meningkatnya logam berat. Sifat toksik logam berat serta masuknya logam berat ke badan air dapat mempengaruhi kualitas air. Logam timbal (Pb) merupakan logam berat yang bersifat toksik yang dapat menyebabkan gangguan pada organ tubuh makhluk hidup (Purnomo & Muchyiddin, 2007).

Penelitian sebelumnya tentang analisis logam timbal pada berbagai jenis ikan di Teluk Palu oleh Hasrat, dkk., (2014) menjelaskan bahwa pada pengujian kualitatif ikan positif mengandung logam timbal (Pb). Hasil pengujian kuantitatif didapatkan kadar rata-rata logam timbal (Pb) adalah: Ikan Petek di lokasi Taman Ria 0,757 mg/kg; di lokasi sekitar Muara Sungai Palu 1,752 mg/kg; di lokasi sekitar Pantai Talise 0,719 mg/kg; Ikan Teri di lokasi Taman Ria 1,989 mg/kg; di lokasi sekitar Muara Sungai Palu 2,075 mg/kg dan di lokasi sekitar Pantai Talise 1,655 mg/kg. Kadar logam timbal (Pb) pada kedua ikan tersebut telah melampaui nilai batas maksimum berdasarkan SNI tahun 2009 yaitu 0,50 mg/kg. Kondisi ini menunjukkan bahwa perairan di kota Palu (Sulawesi Tengah) telah mengalami pencemaran oleh logam timbal (Pb) sehingga diperlukan alternatif untuk mengurangi kadar logam tersebut. Salah satunya dengan menggunakan arang aktif untuk mengadsorpsi logam berat. Arang aktif adalah arang yang dapat menyerap anion, kation, dan molekul dalam bentuk senyawa organik maupun anorganik, cairan ataupun gas (Soetomo, 2012). Arang aktif merupakan senyawa karbon amorf, yang dapat dihasilkan dari bahan-bahan yang mengandung karbon atau dari arang yang diperlakukan dengan cara khusus untuk mendapatkan permukaan yang lebih luas. Arang aktif dapat mengadsorpsi gas dan senyawa-senyawa kimia tertentu atau sifat

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3. Tangkap Layar Jurnal "*Biosorption and Kinetics of Lead Using Tamarindus Indica*"

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Biosorption and Kinetics of Lead Using Tamarindus Indica

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Abstract:

Today heavy metals pollution is a big challenge. Many new technologies came into picture for recovery of metal ions. Among these, Biosorption is one. This research work reported the results using inexpensive biomaterial Tamarindus indica for the removal of lead. Effect of various parameters like time, dosage and initial concentration and kinetic studies were reported. The maximum removal of lead was found to be 82.1%. The optimum agitation time is 35 min and the optimum dosage is 1gm. The maximum removal of lead occurs at initial concentration of 20mg/l. The data suited to both Freundlich and Langmuir adsorption isotherms. This data is well fitted to Langmuir model, with correlation coefficient of 0.98. The kinetic data is better fitted to the pseudo second order model.

Keywords: Biosorption, heavy metals, Tamarindus indica, and adsorption isotherms

1.INTRODUCTION:

The presence of heavy metals in aquatic systems is known to cause severe damage to aquatic life, and these metals kill microorganisms during biological treatment of wastewater with a consequent delay of the process of water purification. Most of the heavy metals are soluble in water and form aqueous solutions and cannot be separated by ordinary physical separation. These heavy metals come from various industries like battery manufacturing and lead paint industry [1].

There are many physical and chemical waste water treatment processes like sedimentation, aeration; screening and adsorption are being used. Among these adsorption is a less expensive process; it converts one form of pollution to other. An eco friendly and economically available technology is much desirable in days to come. Biosorption method is one that easily and effectively removes heavy metals from waste water.

Heavy metals, even at low concentration are difficult to remove by ion exchange, chemical oxidation and other techniques. There is a need of for low cost, easily available and efficient technique for the removal of pollutants. Biosorption, has most economical method in present days for this case [2].

The basic principle of biosorption is that the natural degradation of contaminants by the micro organisms which are housed by the biomaterials. The biomaterial used is tamarind fruit shell, which has no disposal problem. Our present work mainly deals with the efficient usage of tamarindus indica for the removal of lead [3,4].

2. MATERIALS AND METHODS

2.1 Preparation of Tamarind fruit shell Biosorbent :

Tamarind fruit Shells were collected from the natural tamarind trees. The tamarind fruit shells are cleaned with distilled water, after that the biosorbent is dried in an oven at 60^0c for about 24 hours. The dried biomaterial was grounded and then sieved. After this 82.5 µm size particles are used for analysis, which are retained on 120 mesh size. Finally the tamarind fruit shell powder is stored in airtight plastic bottles for further use as biosorbent[5].

2.2 Preparation of stock solution

The lead metal stock solution was prepared by dissolving $Pb(NO3)_2$ in distil water. The test solution consisting of Pb(II) ions is prepared by dilution of 1.00 g/l stock solution. Solution P^H is adjusted with HCL or NaOH.

3. RESULTS AND DISCUSSION:

3.1. Agitation time:

Lead stock solution of 30ml is poured in a conical flask. One gram of 82.5 µm size biosorbent is added. The sample bottle is placed on to a shaker and is kept for 1 min. for adsorption. Similarly the same is followed to different samples at 2, 4, 8, 12, 15, 20, 25, 30, 35, 40, 45, 50 minutes for adsorption. After this samples are collected, filtered and then the readings are noted. From Table.a and Fig.1, it was observed that, with an increase in time, the % Removal of lead increased from 1-35 min. After this no change in percentage removal occurred. So the optimum agitation time is found at 35 minutes [7]. It is noticed that the rate of biosorption is faster in the initial stages because adequate surface area of the biosorbent is available for the adsorption of lead

3.2 .Effect of initial concentration:

30 ml of 5mg/l concentrated solution is taken in a conical flask. One gram of 82.5 µm size biosorbent is added, other concentrations like 20,25,30,35,40,45,50,55 and 60 mg/l are prepared. The bottles are placed on to a shaker for an optimal time period of 35 minutes. After biosorption, sample is filtered and then filtrate is collected separately. From Table.b and Fig.2, it was obsereved that Percentage Removal of lead decreases with increasing initial concentration. We can see at a concentration of 5mg/l lead stock solution the percentage removal is 82.1%[8]. Such behavior can be attributed to the increase in the amount of adsorbate to the unchanging number of available active sites on the biosorbent (since the amount of adsorbent is kept constant).

3.3. Effect of dosage:

30 ml of stock solution is taken in a conical flask. One gram of biosorbent is added. Then the sample is placed on