Title (Judul) Ditulis Dalam Bahasa Indonesia dan bahasa Inggris Dengan Font Times New Roman 12 Maksimum 15 Kata, Uppercase, Ditulis Dengan Susunan Piramida Terbalik

Xxxx Yyy dan Zzzz Www*
Department of Chemistry, Faculty of Mathematics and Natural Sciences
Universitas Negeri Surabaya
Jl. Ketintang, Surabaya (60231), Telp. 031-8298761

** Corresponding author, tel/fax : xxxx-xxxxxxx, email: xxxxxxx@unesa.ac.id*

Abstrak. *Abstrak ditulis dalam dua bahasa, bahasa Indonesia dan bahasa Inggris. Ditulis menggunakan font Times New Roman 11, spasi tunggal, Italic. Abstrak maksimum 200 kata, berisi tentang tujuan, metode dan hasil dari penelitian. Contoh :Telah dibuat dua macam kitosan A dan B.. Beberapa parameter adsorpsi seperti .....dipelajari. Model kinetika .....menentukan laju adsorpsi. Hasil penelitian menunjukkan .....*

Kata kunci *:* **maksimum 4 kata *adsorpsi, Zn(II),Cu(II), kitosan***

Abstract. *Two typies of chitosan have been made, chitosan A and chitosan B……. Adsorption parameters such as,……were studied. The adsorption kinetic …… were applied in the estimation of the adsorption rate. The results showed that …..*

Key words: adsorption, Zn(II), Cu(II), chitosan

PENDAHULUAN (Times New Roman, 11)

Pendahuluan berisi tentang latar belakang dari penelitian, tujuan dan kajian pustaka yang mendukung. Penulisan pustaka yang diacu ditulis dengan sistem penomoran sesuai urutan pustaka yang diacu. Misalnya beberapa adsorben telah digunakan untuk proses adsorpsi ion logam berat [1,2]. Menurut Franco [3] adsorpsi Cr(III) pada bentonit terpilar mempunyai kapasitas adsorpsi yang lebih besar disbanding bentonit yang tidak terpilar. Adsorpsi Cr(III) pada bentonit mempunyai pH optimum 5 [1,4]. Ditulis menggunakan font Times New Roman 11, spasi tunggal.

METODE PENELITIAN

Bahan

Beberapa bahan yang digunakan pada penelitian ini: NaOH, 1 M HCl and 50% (w/v) NaOH; asam asetat, NaOH dan etanol. xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

Alat

Alat yang digunakan pada penelitian ini adalah: pH meter, termometer.

Prosedur Penelitian

Adsorpsi Cu(II)

Yxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxx xxxxxxxxxxxxxxx xxxxxxxxxx xxxxxxxxxxx xxxxxxxxxxxxxx xxxxxxxxxxxxxxxxx xxxx

Pengaruh Keasaman Media

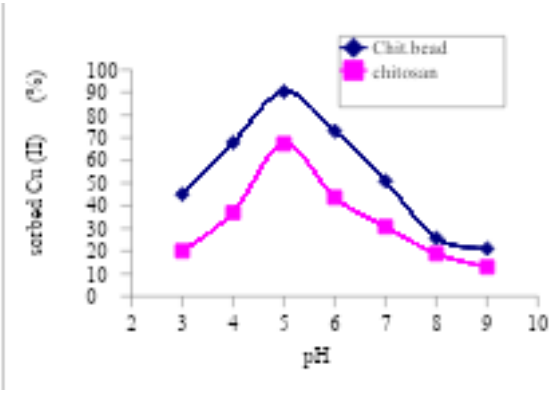
Zxxxxxxxxxx xxxxxxxxxxxxx xxxxxxxxxxxx xxxxxxxx xxxxxxxxxxxxxx xxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxx

HASIL DAN PEMBAHASAN

Pengaruh Keasaman Media

The acidity of the adsorption medium greatly affects the amount of adsorbed Cu(II) (Gambar.1). Adsorption Cu(II) increased with increasing pH from 4.0 to 7.0. From 7.0 to lower acidity, the adsorption Cu(II) significantly decreased. The amount of sorbent Cu(II) was

highly afected by medium acidity. With decreasing medium acidity from 4.0-7.0, the adsorbed CuII) on chitosan beads and chitosan powder sharply increased and at low medium acidity (pH > 7.0), the adsorbed of Cu(II) again decreased rapidly. The similar pattern by profile of the sorbed Cu(II) on the chitosan beads and chitosan powder. The maximum adsorption Cu(II) On chitosan beads and chitosan powder were observed at pH around 7.0.



Gambar 1. Effect of medium acidity on adsorption Cu(II) on chitosan and chitosan beads

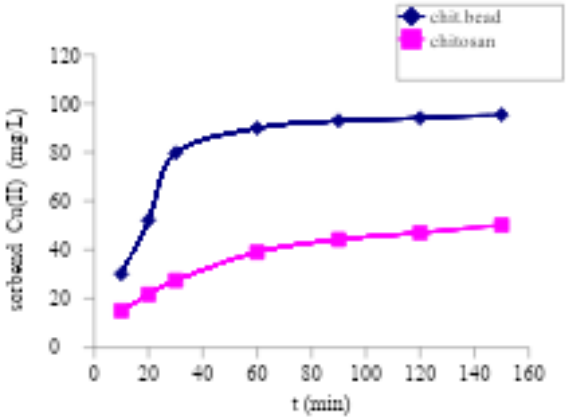
Whereas the optimum pH of adsorption Cd(II) on chitosan beads was 4 [14] and Pb(II) on chitin beads was 5 [12]. The increase of adsorption Cu(II) on chitosan beads and chitosan powder from pH 4.0 to 7.0 must be caused by the decrease of the amount of H^+ in the medium, and therefore, the competition between Cu(II) and H^+ in occupying the active sites on the adsorbents also decreased [10]. At pH higher than 7, the adsorption competed with the precipitation, and the proportion of precipitation and adsorption became relatively the same at 9.0. As a result, the maximum adsorption of Cu(II) occurred just at medium acidity in which Cu(II) started precipitating.

Adsorption kinetics

Although the adsorption of Cu(II) on both chitosan powder and chitosan beads was initially rapid and then slower, the swelling of Chitosan powder became chitosan beads enhanced the adsorption rate (Fig.2). The rapid adsorption for Cu(II) on chitosan powder occurred at the 90 min, while that on chitosan beads at the 60 min.

Applying a kinetic model of first order adsorption reaching equilibrium with the mathematical expression as shown below [5], linear relationship between $\ln(C_{A0}/C_A)C_A$ and t/C_A was obtained with correlation coefficient (R^2) = 0.9874 and 0.9422 for adsorbent of chitosan powder and chitosan beads, while that applying a kinetic pseudo-second order Ho with the mathematical expression as shown below [5] linear relationship between t/qt and t was obtained with correlation coefficient (R^2) = 0,9051and 0,8789 for adsorbent of chitosan powder and chitosan beads, respectively (Table 1). That compared to kinetic model of first order adsorption reaching equilibrium, this type of kinetic model has been proven to posses lower correlation coefficient so that adsorption Cu(II) ion on chitosan powder and chitosan beads tend followed kinetic model of first order adsorption reaching equilibrium.

As can be predicted from Fig.2 that the swelling of chitosan powder may enhance the adsorption rate. This prediction was confirmed, i.e the adsorption rate constant (k_1) increased 3.0 times, from 1.6 $.10^{-3}$ for the adsorbent chitosan powder to $4.8.10^{-3}$ min^{-1} for adsorbent chitosan beads. The swelling process adds the amount of active site suitable for adsorption of metal ion especially for relatively hard metal cations. But the active site must compete with water in attracting the hard cation. xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx



Gambar 2. Effect of contact time on the adsorption of Cu(II) on chitosan powder and chitosan beads

Table 1. Adsorption rate constant and correlation coefficient for the adsorption of Mg(II) on chitosan powder and chitosan beads

Adsorbent	Kinetic model of first order adsorption reaching equilibrium			Kinetic pseudo-second order Ho		
	k_1 10^{-3} (min^{-1})	Q. $(mol/L)^{-1}$	R^2	h (mg g^{-1} min^{-1})	k_2' 10^{-4} (g $mg^{-1}min^{-1}$)	R^2
Chitosan powder	1.60	5.49	0.9874	0.029	9.058	0.9051
Chitosan beads	4.80	22.96	0.9422	0.077	9.058	0.8789

Adsorption thermodynamics

The Langmuir and Freuchlich isotherm adsorption model with the mathematical expression given below was used to determine the capacity (b) and equilibrium constant (K) of adsorption, and energy (E) adsorption was then calculated

Langmuir isotherm model:

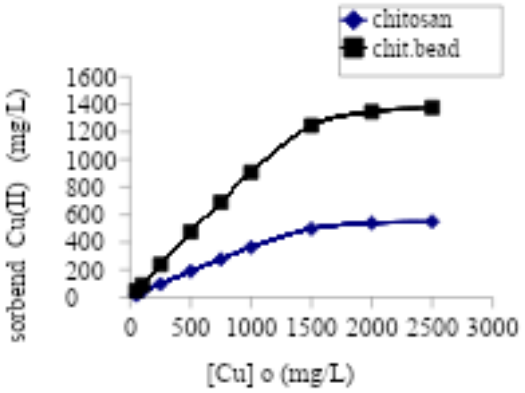
$$\frac{C}{m} = \frac{1}{bK} + \frac{C}{b} \quad (1)$$

Freundlich isotherm model:

$$\log log\, m = \log log\, B + \frac{1}{n}\, logC \quad (2)$$

where C, the equilibrium concentration in solution; b, Langmuir's adsorption capacity; K, adsorption affinity; m metal adsorbed per g adsorbent at equilibrium; B, Freundlich's adsorption capacity and n, constants.

The application of the two models resulted in the adsorption parameters as shown in Table 2. As occur for adsorption rate constant, the swelling of chitosan powder enhanced the adsorption capacity. exponentially with the increase of the free energy [5]. The Langmuir's adsorption capacity is representation of the capacity of nitrogen on the N acetyl group in adsorbing Cu(II), while the Freundlich's adsorption capacity of all possible sites in adsorbing Cu(II). The Langmuir's adsorption capacity may indicate the adsorption capacity of this – NH_2, while the Freundlich's adsorption capacity is a representative of the adsorption capacity of - NH_2 and other functional group all together.



Gambar 3. Effect of concentration on adsorption Cu(II) on chitosan and chitosan bead

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxjkjkxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnn

Table 2. Adsorption capacity (b), Energy (E), and Adsorption affinity (K) obtained from Langmuir isotherm as well as Adsorption capacity (B) obtained from Freundlich isotherm for Mg(II) on Chitosan powder and chitosan beads

Adsorbent	Langmuir				Freundlich		
	b (10^{-4}mole/g)	K $(mol/L)^{-1}$	E (kJ/mol)	R^2	B (10^2mol/g)	n	R^2

Chitosan beads	17.39	6477.16	21.81	0.983	7,60	1,87	0.971
Chitosan powder	7.20	4605.50	21.04	5	12,61	1,42	7
				0.980			0.956
				8			5

KESIMPULAN

Kesimpulan dari penelitian ini adalah..... Adsorption Cu(II) ion on chitosan beads and chitosan powder tend followed kinetic model of first order adsorption reaching equilibrium. Adsorption rate Cu(II) metal ion for the chitosan bead and chitosan powder were 4.80 10^{-3} (min^{-1}) and 1.60 10^{-3} (min^{-1}).

UCAPAN TERIMA KASIH (bila ada)

Kami mengucapkan terima kasih kepada Kementerian Riset dan Teknologi melalui Program ……. No. Kontrak…….

DAFTAR PUSTAKA (urut nomer, bukan abjad) Harvard Style

1. Cardenas, G., Orlando, P., Edelio, T., 2001, Syntesis and Applications of Chitosan Mercaptanes as Heavy Metal Retention Agent. *Int. J. Biol. Macro.,* 28, 167-174.
2. Ding P, Huang., Liu K., Zeng W., 2002, Contribution to the Study of Complexes of Copper by Chitosan an Oligomer, *J.Polymer*.43.1267-1276.
3. Franco, L.O., Maia, R.C., Porto, A.L.2004, Heavy metal biosorption by chitin and chitosan isolated from *cunninghamella elegans*, *Brazilian J. of Microbio*., 35,243-247.
4. Santoso. S. J, Siswanto, D., Kurniawan, A, Rahmanto. W.H. 2007, Hybrid of Chitin and Humic Acid as High Performance Sorbent for Ni(II), *J.Surface Science*. 4, 163.
5. Santoso, S. J, Siswanto, D., Sudiono, S., Sehol M. 2007, Synthesis and Utilization of Chitin -Humic Acid Hybrid as Sorbent for Cr(III), *J.Surface Science*. 4, 161
6. Aksu, Z. 2005. Application of Biosorption for the Removal of organic pollutans . A review. *Process Biochem*. 40.997- 1026.
7. Amesha and R Shitty. 2006, Metal Anion Removal from Wastewater Using Chitosan in Polimer Enhanced Diafiltration System. *Int. J. Biol. Macro., 43*, 467-474
8. Allen, S.J.Gan,Q and Matthews. 2005. Kinetic Modeling of the Adsorption of Basic Dyes by Kudzu. *J.Colloid. Inter.Science* 286. 101-109
9. Benavente, Marta and Ru Lig .2008, Improving the proprties of Chitosan as Suport for the Covalent Multipoint Immobilization of Chymotripsin. Biomacromolecules.9.8. 2170-2179.
10. Gotoh Takeshi and Matsushima. 2004, Preparation of Alginate –Chitosan Hybrid Gel Beads and Adsorpstion of Divalent Metal Ion, *Chemosphere*., 55, 135-140.
11. Hong Meyers, S.P.1989, Crawfish Chitosan as a Coagulant in Recovery of Organic Compounds from Seafood Processing Steam, *J. Agric. Food. Chem*., 37, 580-583.
12. Zhou Dao and Zhang Lina. 2004, Cellulosa/chitin beads for adsorption Heavy metal, *Water Research*., 38.2846-2850.
13. Guibal., Milot, C., Tobin, J.M., 2004. Interactions of Metal Ions with Chitosan Based Sorbent. *Review Separation and Purification Tech*. 38. 43-74.
14. Iowe J.C., Ogunewe , Abia., 2005, Competitive Adsorption Zn(II), Cd(II) and Pb(II) Ions from Aqueous and Non Aqueous Solution. *J.African of Biotechnologi* 4.10.1113-1116