

## **SINTESIS KITOSAN DARI CANGKANG SOTONG (*Sepia sp.*) SERTA APLIKASINYA SEBAGAI ADSORBEN ION LOGAM TEMBAGA (Cu(II)) DALAM LIMBAH INDUSTRI KUNINGAN**

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### **INTISARI**

Penelitian tentang sintesis kitosan dari cangkang sotong (*sepia sp.*) serta aplikasinya sebagai adsorben ion logam tembaga (Cu(II)) dalam limbah industri kuningan telah dilakukan. Kitosan disintesis melalui tiga tahapan, yaitu demineralisasi, deproteinasi, dan deasetilasi. Tahap demineralisasi dilakukan dengan HCl 1,5M, deproteinasi dengan NaOH 3,5%, sedangkan deasetilasi dengan NaOH 60%. Kitosan cangkang sotong dikarakterisasi menggunakan FTIR, SEM-EDX, XRD kemudian digunakan untuk kajian adsorpsi. Parameter adsorpsi yang dikaji meliputi optimasi pH, massa adsorben, waktu interaksi, konsentrasi awal adsorbat, kinetika adsorpsi dan isoterm adsorpsi. Kadar Cu pada larutan uji sebelum dan sesudah adsorpsi diukur dengan *Atomic Absorption Spectroscopy* (AAS).

Hasil penelitian menunjukkan bahwa kitosan berwujud serbuk putih dengan derajat deasetilasi sebesar 73,33% (KCS) dapat disintesis dari cangkang sotong. Karakterisasi SEM menunjukkan morfologi KCS berupa partikel tidak teratur, bergelombang dan berpori. Analisis EDX menunjukkan unsur dominan penyusun kitosan adalah unsur C, N, O, dan Ca yang didukung adanya vibrasi -NH dan COO<sup>-</sup> yang melebar pada FTIR. Ukuran kristal yang teridentifikasi pada XRD setelah adsorpsi mengalami kenaikan. Adsorpsi ion logam Cu(II) 50 mg/L menggunakan KCS mencapai kondisi optimum pada pH 5 dan waktu kontak 15 menit dengan massa 0,1 g. Adsorpsi Cu(II) pada KCS mengikuti kinetika orde kedua semu dengan konstanta laju sebesar 0,23 g mg<sup>-1</sup> menit<sup>-1</sup>. Adsorpsi ion Cu(II) KCS mengikuti model isoterm Temkin dengan konstanta sebesar 9,98 L/mol. Adsorben KCS mampu menyerap ion logam Cu(II) dan Zn(II) dalam limbah kerajinan kuningan yaitu dengan konsentrasi akhir berturut-turut 0,21 dan 0,16 mg/L.

**Kata Kunci:** Adsorpsi, Cangkang Sotong, Kitosan, Limbah Tembaga.

*SYNTHESIS OF CHITOSAN FROM STUFF SHELLS (*Sepia sp.*)  
AND ITS APPLICATIONS AS AN ADSORBENT OF COPPER  
METAL ION Cu(II) IN BRASS INDUSTRIAL WASTE*

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### **ABSTRACT**

Research on the synthesis of chitosan from cuttlefish shells (*sepia sp.*) and its application as an adsorbent for copper metal ion Cu(II) in brass industrial waste has been carried out. Chitosan was synthesized through three stages, namely demineralization, deproteination, and deacetylation. Demineralization step was done with 1.5M HCl, deproteination with 3.5% NaOH and deacetylation with 60% NaOH. Cuttlefish shell chitosan (KCS) was characterized using FTIR, SEM-EDX, XRD and then used for adsorption studies. Adsorption parameters including pH, adsorbent mass, interaction time, initial concentration of adsorbate, adsorption kinetics and adsorption isotherm were systematically studied. Cu levels in the sample solution before and after adsorption were measured by Atomic Absorption Spectroscopy (AAS).

The results shows that white-powder chitosan with a deacetylation degree of 73.33% can be synthesized from cuttlefish shells. SEM characterization indicates that the morphology of KCS is irregular form, wavy and porous particles. EDX analysis shows that the main constituents of chitosan were C, N, O, and Ca elements which are characterized by widened -NH and COO- vibrations on FTIR spectra. The crystallinity of material as shown by XRD increases after adsorption. Adsorption of 50 mg/L Cu(II) metal ions using KCS reached optimum conditions at pH 5 and contact time of 15 minutes with a mass of 0.1 g. KCS and follows pseudo second order kinetics with a rate constant of  $0.23 \text{ g mg}^{-1} \text{ menit}^{-1}$ . Isotherm adsorption of Cu(II) ions on KCS is well described by the Temkin model with a constant of 9.98 L/mol. KCS adsorbent was proved to be able to adsorb Cu(II) and Zn(II) metal ions in brass craft waste giving final concentrations 0.21 and 0.16 mg/L, respectively.

**Keywords:** Adsorption, Chitosan, Copper Waste, Cuttlefish Shell.