SINTESIS ZEOLIT BERBASIS ABU TERBANG YANG DIMODIFIKASI SENG OKSIDA UNTUK ADSORPSI ANTIBIOTIK KLINDAMISIN

SKRIPSI

Diajukan untuk memenuhi sebagian syarat memperoleh gelar Sarjana Sains
Program Studi Kimia

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Skripsi ini diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Sains pada Program Studi Kimia Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

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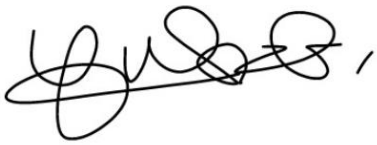

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PERNYATAAN

Dengan ini saya menyatakan bahwa skripsi dengan judul "**Sintesis Zeolit Berbasis Abu Terbang yang Dimodifikasi Seng Oksida untuk Adsorpsi Antibiotik Klindamisin**" ini beserta seluruh isinya adalah benar-benar karya saya sendiri. Saya tidak melakukan penjiplakan atau pengutipan dengan cara-cara yang tidak sesuai dengan etika ilmu yang berlaku dalam masyarakat keilmuan. Atas pernyataan ini, saya siap menanggung risiko/sanksi apabila dikemudian hari ditemukan adanya pelanggaran etika keilmuan atau ada klaim dari pihak lain terhadap keaslian karya saya ini.

Bandung,
27 Agustus 2023

Jessica Veronica

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Segala upaya telah penulis lakukan dalam penyusunan skripsi ini. Akan tetapi, penulis menyadari akan kekurangan karena keterbatasan kemampuan dan pengetahuan penulis. Oleh karena itu, penulis mengharapkan kritik dan saran yang bersifat membangun guna memperbaiki kekurangan tersebut di masa yang akan datang. Penulis berharap dengan adanya skripsi ini dapat memberikan manfaat bagi pembaca, penulis, dan terutama peneliti selanjutnya.

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Penulis

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ABSTRAK

Klindamisin merupakan antibiotik yang banyak digunakan dalam bidang medis setiap tahunnya dan menjadi kontaminan di perairan. Salah satu metode yang efektif untuk mengatasi kontaminasi klindamisin, yaitu adsorpsi. Abu terbang atau *fly ash* (FA) merupakan limbah batu bara yang sebagian besar berasal dari industri tekstil dengan tingkat daur ulang yang rendah sehingga banyak digunakan sebagai adsorben. Penelitian ini bertujuan untuk mendapatkan zeolit berbasis FA yang dimodifikasi seng oksida (ZFA-ZnO) untuk mengadsorpsi antibiotik klindamisin**.** Metode yang digunakan dalam penelitian ini, yaitu sintesis hidrotermal dengan *autoclave* untuk mendapatkan ZFA-ZnO dan pengujian adsorpsi menggunakan sistem *batch*. ZFA-ZnO dikarakterisasi lebih lanjut menggunakan X-ray Diffraction (XRD), Fourier Transform Infrared (FTIR), dan pengujian adsorpsi dilakukan menggunakan instrumen spektrofotometer Ultraviolet-Visible (UV-Vis). Berdasarkan hasil karakterisasi menggunakan XRD, didapatkan keadaan sintesis paling optimum, yaitu pada suhu 160^{o}C selama 9 jam yang ditunjukkan dengan meningkatnya fasa kristalin zeolit dan bertambahnya puncak ZnO. ZFA-ZnO magnetik pada suhu 160^{o}C (ZFA-ZnO160 M) merupakan jenis zeolit dengan persentase adsorpsinya paling tinggi, yaitu sebesar 89,41%. Data adsorpsi menunjukkan bahwa pH optimum untuk mengadsorpsi antibiotik klindamisin, yaitu pH 6 dengan persentase adsorpsi untuk ZFA160 M sebesar 82,43% dan ZFA-ZnO160 M sebesar 94,5%. Data isoterm adsorpsi untuk ZFA160 M paling sesuai dengan model Langmuir dengan regresi kuadrat 0,98837 dan chi kuadrat 0,24054. Sedangkan untuk ZFA-ZnO160 M, data adsorpsi sesuai dengan model isoterm Redlich Peterson dengan regresi kuadrat 0,99674 dan chi kuadrat 0,07293. Mekanisme adsorpsi diduga berlangsung secara monolayer melalui interaksi pada gugus fungsi aktif pada zeolit, yaitu Si-O, hasil diperkuat dengan analisis serapan gugus fungsi pada FTIR.

Kata kunci: *ZFA-ZnO, magnetik, adsorpsi, klindamisin, zeolit*

ABSTRACT

Clindamycin is an antibiotic that is widely used in the medical field every year and is a contaminant in waters. One effective method for dealing with clindamycin contamination is adsorption Fly ash (FA) is coal waste which mostly comes from the textile industry with a low recycling rate so it is widely used as an adsorbent. This study aims to obtain FA-based zeolite modified by zinc oxide (ZFA-ZnO) to adsorb the antibiotic clindamycin. The method used in this study was hydrothermal synthesis with an autoclave to obtain ZFA-ZnO and the batch system was used for adsorption testing. ZFA-ZnO was further characterized using X-ray Diffraction (XRD), Fourier Transform Infrared (FTIR), and adsorption tests were carried out using an Ultraviolet-Visible (UV-Vis) spectrophotometer. Based on the results of the characterization using XRD, the optimum synthesis conditions were obtained, namely at 160^{o}C for 9 hours as indicated by an increase in the zeolite crystalline phase and an increase in the ZnO peak. Magnetic ZFA-ZnO at a temperature of 160^{o}C (ZFA-ZnO160 M) was a type of zeolite with the highest adsorption percentage, namely 89.41%. Adsorption data showed that the optimum pH for adsorbing clindamycin antibiotics was pH 6 with an adsorption percentage for ZFA160 M of 82.43% and ZFA-ZnO160 M of 94.5%. The adsorption isotherm data for ZFA160 M best fits the Langmuir model with a quadratic regression of 0.98837 and a chi square of 0.24054. Meanwhile for ZFA-ZnO160 M, the adsorption data is in accordance with the Redlich Peterson isotherm model with a quadratic regression of 0.99674 and a chi square of 0.07293. The adsorption mechanism is thought to take place in a monolayer manner through the interaction of the active functional groups in the zeolite, namely Si-O, the results are confirmed by functional group absorption analysis on FTIR.

Keywords: *ZFA-ZnO, magnetic, adsorption, clindamycin, zeolite*

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