GREEN SYNTHESIS ZnO NPs MENGGUNAKAN BIOREDUKTOR KATEKIN UNTUK FOTODEGRADASI AMOKSISILIN

SKRIPSI

Diajukan untuk memperoleh gelar Sarjana Sains Program Studi Kimia

Disusun oleh:

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PROGRAM STUDI KIMIA

FAKULTAS PENDIDIKAN MATEMATIKA DAN ILMU PENGETAHUAN ALAM

UNIVERSITAS PENDIDIKAN INDONESIA

BANDUNG

2024

Green Synthesis ZnO NPs menggunakan Bioreduktor Katekin untuk Fotodegradasi Amoksisilin

Oleh
Kezia Yulianly Velda Nababan

Sebuah skripsi yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Sains pada Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

PERNYATAAN KEASLIAN

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Menyatakan bahwa skripsi yang berjudul "***GREEN SYNTHESIS* ZnO NPs MENGGUNAKAN BIOREDUKTOR KATEKIN UNTUK FOTODEGRADASI AMOKSISILIN"** 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 pengetahuan yang berlaku di masyarakat.

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.

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GREEN SYNTHESIS ZnO NPs MENGGUNAKAN BIOREDUKTOR KATEKIN UNTUK FOTODEGRADASI AMOKSISILIN

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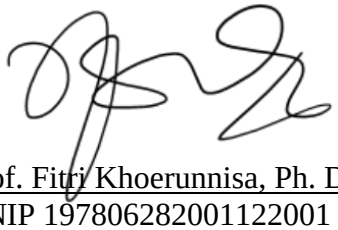

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KATA PENGANTAR

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Penyusunan skripsi ini dilakukan sebagai salah satu persyaratan akademik untuk menyelesaikan pendidikan pada program studi kimia. Skripsi ini merupakan hasil penelitian yang disajikan dari masalah penelitian, metode sintesis nanopartikel zink oksida, karakterisasi, analisis data, dan kesimpulan yang didukung dari berbagai teori yang dikemukakan oleh para ahli.

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Penulis

ABSTRAK

Antibiotik Amoksisilin (AMX) merupakan salah satu jenis obat dengan jumlah penggunaan yang tinggi di dunia. Pencemaran limbah AMX di perairan yang bersumber dari pabrik pengolahan limbah obat, dan limbah medis, berdampak pada peningkatan resistensi mikroba dan efek toksiknya. Fotodegradasi menjadi salah satu solusi untuk mendegradasi cemaran AMX. Penelitian ini bertujuan untuk mensintesis ZnO NPs melalui metode *green synthesis*, mengetahui karakteristik ZnO NPs hasil sintesis dan kinerjanya sebagai katalis dalam fotodegradasi AMX. ZnO NPs disintesis menggunakan metode *green synthesis* dengan bioreduktor katekin. ZnO NPs hasil sintesis dikarakterisasi menggunakan *X-Ray Diffraction* (XRD), *Fourier-Transform Infrared Spectroscopy* (FTIR), dan *Particle Size Analyzer* (PSA). Pengujian fotokatalitik ZnO NPs dalam degradasi AMX dilakukan dengan variasi sinar UV-A dan UV-C, pH, waktu penyinaran, konsentrasi limbah, dan dosis katalis. Efisiensi degradasi AMX ditentukan menggunakan spektrofotometer *Ultraviolet-Visible* (UV-Vis). ZnO NPs berhasil disintesis dengan metode *green synthesis* pada kondisi optimum kalsinasi 600℃ dengan % *yield* 13.07%. Keberhasilan sintesis ZnO NPs dikonfirmasi melalui kemunculan puncak difraksi yang sesuai dengan JCPDS ZnO yang identik dengan struktur kisi ZnO dengan indeks hkl (100), (002), (102), (110), (103), (200), (112), (201), (004), dan (202) serta ukuran kristal 13.14 nm dengan kristalinitas 75.7%. Spektra IR mengkonfirmasi pembentukan ZnO NPs dengan kemunculan puncak Zn-O pada panjang gelombang 649 cm^{-1}. Ukuran partikel ZnO NPs berdasarkan pengukuran PSA adalah 79.49 nm. Efisiensi degradasi AMX paling optimum untuk fotokatalis pada sinar UV-A dan UV-C mencapai 97,37 % $\pm$ 1.6 dan 90,78 $\pm$ 0,6 secara berturut-turut pada pH 3 dan 9, konsentrasi limbah 40 ppm dan 80 ppm, dosis katalis 2 mg dan 10 mg dan waktu penyinaran selama 120 menit dan 30 menit.

Kata kunci: fotodegradasi, *green synthesis*, amoksisilin, ZnO NPs, katekin

ABSTRACT

Amoxicillin (AMX) antibiotic is one of the most widely used drugs in the world. Pollution of AMX waste in waters sourced from drug waste treatment plants, and medical waste, has an impact on increasing microbial resistance and toxic effects. Photodegradation is one of the solutions to degrade AMX contamination. This study aims to synthesise ZnO NPs through green synthesis method, determine the characteristics of the synthesised ZnO NPs and its performance as a catalyst in AMX photodegradation. ZnO NPs were synthesised using green synthesis method with catechin bioreductor. The synthesised ZnO NPs were characterised using X-Ray Diffraction (XRD), Fourier-Transform Infrared Spectroscopy (FTIR), and Particle Size Analyzer (PSA). Photocatalytic testing of ZnO NPs in AMX degradation was conducted with variations of UV-A and UV-C light, pH, irradiation time, effluent concentration, and catalyst dosage. AMX degradation efficiency was determined using an Ultraviolet-Visible (UV-Vis) spectrophotometer. ZnO NPs were successfully synthesised by green synthesis method at the optimum condition of calcination of 600℃ with a yield of 13.07%. The successful synthesis of ZnO NPs was confirmed through the appearance of diffraction peaks corresponding to the JCPDS of ZnO which are identical to the ZnO lattice structure with hkl indices (100), (002), (102), (110), (103), (200), (112), (201), (004), and (202) and a crystal size of 13.14 nm with a crystallinity of 75.7%. IR spectra confirmed the formation of ZnO NPs with the appearance of Zn-O peak at 649 cm-1 wavelength. The particle size of ZnO NPs based on PSA measurement was 79.49 nm. The most optimum AMX degradation efficiency for the photocatalyst under UV-A and UV-C light reached 97.37% ± 1.6 and 90.78 ± 0.6 at pH 3 and 9, effluent concentrations of 40 ppm and 80 ppm, catalyst doses of 2 mg and 10 mg and irradiation times of 120 min and 30 min, respectively.

Keywords: photodegradation, green synthesis, amoxicillin, ZnO NPs, catechin

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DAFTAR TABEL

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