

ABSTRAK

PENGARUH IRADIASI SINAR TAMPAK PADA NANOMATERIAL S/CuO/TiO₂ (0,25/1 DAN 0,75/1) DALAM AKTIVITAS SEBAGAI ANTIBAKTERI (*Bacillus subtilis* DAN *Escherichia coli*) DAN ANTIJAMUR (*Candida albicans*)

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Pada penelitian ini telah dilakukan sintesis nanomaterial berbasis tembaga oksida (CuO) dari prekursor Cu(NO₃)₂·3H₂O menggunakan metode sol-gel dan titanium dioksida (TiO₂) yang disintesis dari prekursor titanium isopropoksida (TTIP). Proses doping sulfur ke dalam CuO menghasilkan katalis S/CuO dengan rasio 1/1. Katalis tersebut kemudian diimpregnasi ke dalam TiO₂ menggunakan metode impregnasi basah dengan bantuan *ultrasonic cleaner* untuk menghasilkan nanomaterial S/CuO/TiO₂ dengan perbandingan 0,25/1 dan 0,75/1. Karakterisasi menggunakan *X-Ray Diffraction* (XRD) menunjukkan bahwa ukuran kristalit nanomaterial yang terbentuk adalah 35,86 nm dan 32,15 nm. Sementara itu, analisis menggunakan *Diffuse Reflectance Spectroscopy* (DRS) menunjukkan bahwa nilai energi band gap masing-masing nanomaterial adalah 2,88 eV dan 2,60 eV, menunjukkan potensi aktivitas fotokatalitik oleh cahaya tampak. Uji aktivitas antibakteri dan antijamur dilakukan terhadap lima sampel (CuO, TiO₂, S/CuO, dan S/CuO/TiO₂ 0,25/1; 0,75/1) konsentrasi 8% (80 mg/mL) dengan metode difusi sumuran. Hasil uji menunjukkan bahwa nanomaterial tersebut mampu menghambat pertumbuhan bakteri *Escherichia coli* dan *Bacillus subtilis* dengan zona hambat berkisar antara 1 - 7,5 mm setelah penyinaran dengan cahaya tampak selama 60 menit. Selain itu, pengujian terhadap jamur *Candida albicans* juga menunjukkan aktivitas antijamur dengan zona hambat sebesar 2–5 mm dalam kondisi penyinaran yang sama.

Kata kunci : CuO, S/CuO/TiO₂, Iradiasi Sinar Tampak, Difusi Sumuran, Antibakteri, Antijamur.

ABSTRACT

THE EFFECT OF VISIBLE LIGHT IRRADIATION ON S/CuO/TiO₂ (0.25/1 AND 0.75/1) NANOMATERIALS IN THE ACTIVITY AS ANTIBACTERIAL (*Bacillus subtilis* AND *Escherichia coli*) AND ANTIFUNGAL (*Candida albicans*)

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In this research, nanomaterials based on copper oxide (CuO) were synthesized from the precursor Cu(NO₃)₂·3H₂O using the sol-gel method, and titanium dioxide (TiO₂) was synthesized from the precursor titanium isopropoxide (TTIP). Sulfur doping into CuO resulted in the formation of the S/CuO catalyst with a 1/1 ratio. This catalyst was then impregnated into TiO₂ using the wet impregnation method assisted by an ultrasonic cleaner, producing S/CuO/TiO₂ nanomaterials with ratios of 0.25/1 and 0.75/1. Characterization using X-ray Diffraction (XRD) showed that the crystallite sizes of the resulting nanomaterials were 35,86 nm and 32,15 nm, respectively. Meanwhile, analysis using Diffuse Reflectance Spectroscopy (DRS) indicated that the band gap energies of the nanomaterials were 2,88 eV and 2,60 eV, demonstrating potential photocatalytic activity under visible light. Antibacterial and antifungal activity tests were carried out on five samples (CuO, TiO₂, S/CuO, and S/CuO/TiO₂ with ratios 0.25/1 and 0.75/1) 8% (80 mg/mL) using the well diffusion method. The results showed that the nanomaterials were able to inhibit the growth of *Escherichia coli* and *Bacillus subtilis*, with inhibition zones ranging from 1 to 7.5 mm after 60 minutes of visible light irradiation. Additionally, the antifungal test against *Candida albicans* also demonstrated antifungal activity, with inhibition zones ranging from 2 to 5 mm under the same irradiation conditions.

Keywords: CuO, S/CuO/TiO₂, Visible Irradiation, Well Diffusion, Antibacterial, Antifungal