

SINTESIS KOMPOSIT GRAFENA OKSIDA/ZnO-Ni SEBAGAI FOTOKATALIS PADA DEGRADASI LARUTAN KONGO MERAH

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INTISARI

Sintesis komposit grafena oksida/ZnO-Ni sebagai fotokatalis pada degradasi larutan *congo red* (kongo merah) telah dilakukan. Penelitian ini bertujuan untuk memodifikasi karakter dan performa fotokatalis material ZnO dengan penambahan grafena oksida (GO) dan dopan Ni yang memiliki aktivitas fotokatalitik pada paparan sinar tampak dan sinar UV. Penelitian diawali dengan sintesis material GO dengan metode Hummer termodifikasi, kemudian pendispersian ZnO pada permukaan GO sehingga terbentuk komposit GO/ZnO, dan doping Ni dengan variasi konsentrasi Ni 1, 3, 5, dan 7% sehingga terbentuk GO/ZnO-Ni. Material hasil sintesis dikarakterisasi dengan instrumen spektrometer FT-IR, XRD, SEM-EDX, TEM, dan spektrofotometer DR UV-Visibel. Uji aktivitas fotokatalis GO/ZnO-Ni pada degradasi fotokatalitik larutan kongo merah dilakukan dalam reaktor tertutup dengan sistem batch. Hasil degradasi dianalisis dengan spektrofotometri UV-Visibel.

Hasil penelitian menunjukkan bahwa komposit GO/ZnO-Ni berhasil disintesis. Hal ini didukung dengan data spektrum FT-IR yang menunjukkan vibrasi ulur Zn-O-C dan Ni-O pada komposit GO/ZnO-Ni. Data difraktogram yang mengindikasikan keberadaan puncak karakteristik GO dan ZnO. Citra SEM yang menunjukkan morfologi material GO berupa lembaran dengan partikel ZnO dan Ni yang terdistribusi pada lembaran GO. Keberhasilan doping logam Ni dilihat melalui data DR UV-Visibel berupa energi celah pita yang mengalami penurunan seiring dengan kenaikan konsentrasi dopan hingga titik optimum. Komposit GO/ZnO-Ni optimum pada konsentrasi Ni 5% dengan energi celah pita sebesar 3,05 eV. Hasil uji aktivitas fotokatalitik menunjukkan bahwa fotokatalis GO/ZnO-Ni 5% mampu mendegradasi 20 mL larutan kongo merah 10 ppm pada pH 5 dengan massa fotokatalis 20 mg selama waktu penyinaran 120 menit. Hasil degradasi kongo merah diperoleh secara optimum sebesar 97,84% dan 89,88% masing-masing pada paparan sinar tampak dan sinar UV.

Kata kunci: degradasi, fotokatalis, GO/ZnO-Ni, kongo merah.

SYNTHESIS OF GRAPHENE OXIDE/ZnO-Ni COMPOSITE AS PHOTOCATALYST ON THE DEGRADATION OF CONGO RED SOLUTION

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ABSTRACT

Synthesis of graphene oxide/ZnO-Ni composite as a photocatalyst on the degradation of congo red solution has been carried out. This research aimed to modify the character and photocatalytic performance of ZnO material with the addition of graphene oxide (GO) and Ni dopant that has photocatalytic activity under visible light and UV light illumination. The research was started by synthesizing GO material using the modified Hummer method, then dispersing ZnO on the GO surface to form a GO/ZnO composite, and doping Ni process was carried out with various concentrations of Ni 1, 3, 5, and 7% to form GO/ZnO-Ni composites. The synthesized materials were characterized using FT-IR, XRD, SEM-EDX, TEM spectrometer, and spectrophotometer DR UV-Visible instruments. The examination of the activity of the photocatalyst was performed on the photocatalytic degradation of congo red solution in a closed reactor Using the batch system. The result of the degradation was analyzed using UV-Visible spectrophotometry.

Results showed that the GO/ZnO-Ni photocatalyst was successfully synthesized. This is supported by FT-IR spectra data showing Zn-O-C and Ni-O stretching vibration in GO/ZnO-Ni composite. Diffractogram data indicating the presence of characteristic peaks of GO and ZnO. The SEM images show the morphology of the GO material in the form of sheets decorated with ZnO and Ni particles. The success of Ni doping was seen in the DR UV-Visible data from the band gap energy decreasing as the dopant concentration increased to an optimum point. Doping Ni metal in GO/ZnO-Ni optimum at 5% Ni concentration with a band gap energy of 3.05 eV. The photocatalytic activity test results showed that the GO/ZnO-Ni 5% photocatalyst was able to degrade 20 mL congo red solution 10 ppm at pH 5 using photocatalyst mass of 20 mg for 120 minutes of irradiation time. Congo red optimum degradation were obtained at 97.84 and 89.88% under visible and UV light, respectively.

Keywords: congo red, degradation, GO/ZnO-Ni, photocatalyst.