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**Sintesis fotokatalis BiOI terembankan pada haloisit tanah vulkanik Gamalama untuk fotodegradasi zat
warna kationik dan anionik**
INDRA CIPTA, Prof. Indriana Kartini, S.Si.,M.Si., Ph.D. ; Akhmad Syoufian, S.Si., ph.D.
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SINTESIS FOTOKATALIS BiOI TEREMBANKAN PADA HALOISIT TANAH VULKANIK GAMALAMA UNTUK FOTODEGRADASI ZAT WARNA KATIONIK DAN ANIONIK

Indra Cipta

17/420349/SPA/00618

INTISARI

Dengan menggunakan haloisit dari tanah vulkanik Gamalama sebagai material pendukung fotokatalis, aktivitas BiOI untuk mendegradasi zat warna kationik metilen biru dan zat warna anionik metil orange telah berhasil ditingkatkan pada penelitian ini. Sampel tanah vulkanik Gamalama diambil dari lima lokasi dengan 3 kedalaman yang berbeda, yaitu 30, 70, dan 100 cm dari permukaan. Fotokatalis BiOI/Haloisit disintesis menggunakan metode solvotermal pada temperatur 160^{o}C selama 20 jam. Pada penelitian ini telah dipelajari pengaruh jenis pelarut, konsentrasi prekursor, dan berat haloisit, terhadap struktur dan karakter fotokatalis BiOI/Haloisit. Haloisit dan fotokatalis BiOI/Haloisit yang diperoleh dikarakterisasi menggunakan FTIR, XRD, SEM, TEM, DRUV-Vis, dan XPS. Uji aktivitas fotokatalis BiOI dan BiOI/Haloisit dilakukan untuk fotodegradasi zat warna metilen biru dan metil orange dengan optimasi pH, durasi penyinaran, dan massa fotokatalis. Konstanta laju degradasi ditentukan menggunakan persamaan kinetika *pseudo first order*.

Hasil penelitian menunjukkan, haloisit tanah vulkanik Gamalama ditemukan pada kedalaman 70 cm dari permukaaan dari tiap lokasi sampel, memiliki morfologi tabung dengan ukuran diameter 10 – 20 nm, dan panjang 50 – 100 nm. Pengembanan BiOI pada haloisit berhasil menaikkan energi *band gap* BiOI sebesar 0,15 eV. Fotodegradasi metilen biru optimal mencapai 98,44 % diperoleh pada kondisi pH 6, durasi penyinaran 60 menit, dan massa fotokatalis BiOI/Haloisit 20 mg. Zat warna metil orange terdegradasi paling efektif sebesar 66,22% diperoleh pada pH 3, durasi penyinaran 5 jam, dan massa fotokatalis BiOI/Haloisit 50 mg. Penambahan haloisit berhasil meningkatkan kemampuan BiOI mendegradasi MB sebanyak 65% dan MO 17%. Hasil perhitungan konstanta laju degradasi menggunakan persamaan kinetika -*pseudo first order* menunjukkan haloisit efektif meningkatkan laju fotodegradasi MB 18,52 dan metil orange 1,22 kali.

Kata kunci: Fotokatalis, Fotodegradasi, Haloisit, BiOI, BiOI/Halloysite

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SYNTHESIS OF BiOI SUPPORTED ON HALLOYSITE FROM GAMALAMA VOLCANIC SOIL FOR CATIONIC AND ANIONIC DYES PHOTODEGRADATION

Indra Cipta

17/420349/SPA/00618

ABSTRACT

By using halloysite from Gamalama volcanic soil as a photocatalyst-supported material, the activity of BiOI to degrade the cationic dye methylene blue and the anionic dye methyl orange has been successfully increased in this study. Gamalama volcanic soil samples were taken from five locations with 3 different depths, namely 30, 70, and 100 cm from the surface. BiOI/Halloysite photocatalyst was synthesized using the solvothermal method at 160^{o}C for 20 hours. In this research, the effect of solvent type, precursor concentration, and weight of halloysite on the structure and character of the BiOI/Halloysite photocatalyst has been studied. The halloysite and the obtained BiOI/Halloysite photocatalyst were characterized using FTIR, XRD, SEM, TEM, DRUV-Vis, and XPS. The photocatalytic activity tests of BiOI and BiOI/Haloisite were carried out for the photodegradation of methylene blue and methyl orange dyes by optimizing pH, irradiation duration, and photocatalyst mass. The degradation rate constant was determined using pseudo-first-order kinetic equations.

The results showed that Gamalama volcanic soil halloysite was found at a depth of 70 cm from the surface of each sample location, and had a tube morphology with a diameter of 10 − 20 nm, and a length of 50 − 100 nm. The supported BiOI on the halloysite succeeded in increasing the BiOI band gap energy by 0.15 eV. The optimal photodegradation of methylene blue, 98.44% was obtained at pH 6, irradiation duration of 60 minutes, and mass of photocatalyst BiOI/Halloysite 20 mg. The most effective degraded methyl orange dye 66.22% was obtained at pH 3, the irradiation duration was 5 hours, and the mass of the photocatalyst BiOI/Halloysite was 50 mg. The addition of halloysite succeeded in increasing the ability of BiOI to degrade methylene blue by 65% and methyl orange by 17%. The results of the calculation of the degradation rate constant using the pseudo-first-order kinetic equation showed that halloysite was effective in increasing the photodegradation rate of methylene blue by 18.52 and methyl orange 1.22 times.

Keywords: Photocatalyst, Photodegradation, Halloysite, BiOI, BiOI/Halloysite