

Studi aktivitas fotokatalitik nanokatalis heterostruktur TiO₂ facet {001} dengan nanorod emas terhadap fotodegradasi methylene blue pada sinar tampak = Photocatalytic activity study of heterostructure nanocatalyst TiO₂ facet {001} and gold nanorods on photodegradation of methylene blue in visible light.

Iluk Hayuningtyas, author

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Abstrak

Kebutuhan air bersih meningkat seiring dengan bertambahnya populasi penduduk, namun kebutuhan air bersih tercemar karena kontaminasi limbah cair salah satunya akibat zat warna, proses degradasi zat warna sangat perlu dilakukan dalam upaya reduksi pencemaran air, Salah satu metode yang dapat dilakukan adalah fotodegradasi. Pada penelitian ini dilakukan fotodegradasi zat warna Methylene Blue melalui proses fotokatalitik dengan nanokatalis heterostruktur Au-TiO₂. Sintesis TiO₂ Nanosheet yang melalui metode Hidrotermal, didapatkan nilai celah pita sekitar 3.38 eV untuk struktur Anatase dengan panjang rata-rata 28 nm dan ketebalan 3.05 nm. Au Nanorod disintesis melalui metode Seeds Mediated Growth dengan variasi penambahan AgNO₃ menghasilkan profil fenomena resonansi permukaan plasmon (SPR) yang berbeda dengan serapan paling tinggi pada 800 nm dan aspect ratio yang meningkat dari 3.7-4.5. Integrasi dilakukan dengan metode Ligand Exchange dan pengaturan pH. Laju kinetika tertinggi dari hasil fotodegradasi dicapai oleh Au-TiO₂ yang diintegrasikan melalui metode Ligand Exchange sebesar 0.1029 min⁻¹.

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Demand of clean water increase along with an increase in population, but the presence of organic dyes has become one of the reasons of water contaminant and becoming an environmental problem, the treatment of dye removal nowadays is become very necessary to reduce water pollution. The most efficient and reliable method to degraded organic dyes is using photodegradation method. In this research, we report the result of Methylene Blue photodegradation through the photocatalytic process using Au-TiO₂ heterostructured nanocatalysts. TiO₂ nanosheets was synthesized through hydrothermal method, the band gap value is 3.38 eV for Anatase structures with an average length of 28 nm and thickness of 3.05 nm. Gold nanorods was synthesized through Seeds Mediated Growth method with variations in the addition of AgNO₃. Show a different profile of the Surface Plasmon Resonance (SPR) phenomenon with the highest absorption at 800 nm and an increased aspect ratio from 3.7-4.5. Integration of Au-TiO₂ was done by the Ligand Exchange Method and pH control. The high kinetic rate was achieved from Au-TiO₂ nanocatalyst done by the Ligand Exchange Method with 0.1029 min⁻¹.