

PREPARASI DAN KARAKTERISASI TiO₂ TERMODIFIKASI CAMPURAN OKSIDA SnO₂ DAN La₂O₃ UNTUK MENINGKATKAN AKTIVITAS FOTODEGRADASI METILEN BIRU DI BAWAH SINAR TAMPAK

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INTISARI

Preparasi TiO₂ termodifikasi campuran oksida SnO₂ dan La₂O₃ telah dilakukan untuk menghasilkan fotokatalis yang aktif pada sinar tampak. Preparasi dilakukan dengan metode ko-presipitasi yang meliputi proses pelarutan reaktan menggunakan larutan HNO₃ dan pengendapan kembali menggunakan larutan NaOH. Padatan yang diperoleh dikalsinasi dan dikarakterisasi menggunakan instrumentasi XRD, SRUV, FTIR, dan SEM-EDX. Rasio Sn/La yang optimal ditentukan melalui uji fotodegradasi metilen biru pada sinar tampak. Mekanisme fotodegradasi diketahui melalui uji penangkap radikal dengan menambahkan 2-propanol, benzoquinon, dan EDTA ke dalam sampel metilen biru.

Hasil karakterisasi menunjukkan bahwa material hasil preparasi terdiri dari campuran oksida SnO₂/La₂O₃/TiO₂ yang memiliki energi celah pita lebih rendah sehingga aktivasi fotokatalis dapat terjadi di bawah sinar tampak. Variasi komposisi optimal diperoleh pada rasio Sn/La 10 yang menghasilkan penurunan konsentrasi metilen biru mencapai 81,3%. Peningkatan aktivitas fotokatalitik pada SnO₂/La₂O₃/TiO₂ berasal dari kombinasi penurunan energi celah pita, peningkatan adsorpsi, serta penghambatan proses rekombinasi. Hasil uji penangkap radikal menunjukkan bahwa aktivitas fotokatalitik SnO₂/La₂O₃/TiO₂ paling banyak dipengaruhi oleh pembentukan spesies radikal hidroksil.

Kata kunci: ko-presipitasi, kombinasi semikonduktor, metilen biru, TiO₂.

PREPARATION AND CHARACTERIZATION OF TiO₂ MODIFIED WITH MIXED OXIDES SnO₂ AND La₂O₃ TO INCREASE THE PHOTODEGRADATION ACTIVITY OF METHYLENE BLUE UNDER VISIBLE LIGHT

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ABSTRACT

The preparation of TiO₂ modified by SnO₂ and La₂O₃ mixed oxides had been carried out to produce photocatalysts that can be activated under visible light. The preparation was carried out by the co-precipitation method which included the dissolution of the reactants using HNO₃ solution and re-precipitation using NaOH solution. The solids obtained were calcined and characterized using XRD, SRUV, FTIR, and SEM-EDX instrumentations. The optimal Sn/La ratio was determined by the photodegradation test of methylene blue under visible light. The mechanism of photodegradation was determined through a radical scavenging test by adding 2-propanol, benzoquinone, and EDTA to the methylene blue sample.

The characterization results showed that the prepared material consisted of SnO₂/La₂O₃/TiO₂ mixed oxides which had a lower band gap energy so that photocatalyst activation can occur under visible light. The optimal composition variation was obtained at the ratio of Sn/La 10 which resulted in a decrease in the concentration of methylene blue up to 81.3%. The increase in photocatalytic activity in SnO₂/La₂O₃/TiO₂ came from a combination of decreasing band gap energy, increasing adsorption, and inhibiting the recombination process. The results of the radical scavenging test showed that the photocatalytic activity of SnO₂/La₂O₃/TiO₂ was most influenced by the formation of hydroxyl radical species.

Keywords: co-precipitation, methylene blue, semiconductor heterojunction, TiO₂.