Sintesis Material Fotokatalis Tungsten Oksida Terdoping Platinum (WO_3/Pt) dan Aplikasinya untuk Degradasi Zat Warna Menggunakan Cahaya Tampak

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Abstrak

Tungsten oksida (WO_3) merupakan material fotokatalis dengan celah pita energi ~ 2,7-2,8 eV sehingga responsif terhadap spektrum yang luas dari iradiasi cahaya matahari. Penambahan doping Pt dapat meningkatkan aktivitas fotokatalis pada cahaya tampak. Pada penelitian ini diteliti pengaruh penambahan doping Pt (0%, 1%, 2%, dan 4%) terhadap sturktur kristal, ukuran kristal, morfologi film, sifat optis film, dan aktivitas fotokatalis. Sintesis WO_3/Pt pada substrat kaca menggunakan metode *spray deposition* dan proses doping Pt menggunakan metode fotodeposisi. Hasil karakterisasi film WO_3 dan WO_3/Pt menggunakan *X-rays diffraction* (XRD) menunjukkan dengan penambahan doping Pt akan menyebabkan peningkatan intensitas pada orientasi bidang (111) dan akan meningkatkan ukuran kristal. Analisis morfologi film WO_3 dan WO_3/Pt hasil karakterisasi *Scanning Electron Microscopy* (SEM) menunjukkan film yang terbentuk relatif rata, dan tidak terdapat retakan, namun memiliki ukuran yang tidak seragam. Penambahan doping Pt menunjukkan pada morfologi film muncul adanya struktur pilar. Pt berhasil ditumbuhkan pada permukaan WO_3 diidentifikasi menggunakan *Transmission Electron Microscopy* (TEM). Hasil pengukuran sifat optis film WO_3 dan WO_3/Pt menggunakan spektrofotometer *Uv-Vis*, dengan menambahkan doping dapat menurunkan nilai transmitansi film serta terjadi penyempitan celah pita energi dari WO_3. Uji aktivitas fotokatalis menunjukkan bahwa material fotokatalis WO_3 dengan penambahan doping Pt mampu mendegradasi zat warna *methylene blue*. Aktivitas fotokatalis terbaik dengan penambahan doping Pt 4%.

Kata kunci : Tungsten oksida, Platinum, Fotokatalis, Aktivitas fotokatalis, Cahaya tampak, Fotodeposisi, Spray deposition, *Methylene blue*, Doping

Synthesis of Platinum Doped Tungsten Oxide (WO3/Pt) Photocatalyst Material and Its Application for Dyes Degradation Using Visible Light

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Abstract

Tungsten oxide (WO_3) is a photocatalyst material with a band gap energy ~ 2,7-2,8 eV so responsive toward a wide spectrum of sunlight irradiation. Addition of doping Pt can increase the photocatalytic activity on visible light. In this study, has been research to know the influence of the addition doping Pt (0%, 1%, 2%, and 4%) toward crystal structures, crystal size, morphology of the film, optical properties of the film, and photocatalytic activity. Synthesis WO_3/Pt on a glass substrate using spray deposition and doping Pt process using fotodeposition method. Result of the characterization of film WO_3 and WO_3/Pt using X-rays diffraction (XRD) showed the addition of Pt doping will cause increases intensity of the plane orientation (111) and will increase crystal size. Analysis of the morphology of films WO_3 and WO_3/Pt characterization results Scanning Electron Microscopy (SEM) showed that the film formed relatively flat, and there are no cracks, yet have un-uniform size. The addition of Pt doping showed the film morphology appears the presence pillar structure. Pt successfully grown on the surface of WO_3 identified using Transmission Electron Microscopy

(TEM). Results of measurements of the optical properties of films WO_3 and WO_3/Pt using Uv-Vis spectrophotometer, by adding doping decrease value of the film transmittance along occur band gap energy narrowing of WO_3. Photocatalytic activity test resulted that the WO_3 photocatalyst material with the addition of Pt doping can degradation of methylene blue dye. The best photocatalyst activity with the addition of 4% Pt doping.

Keywords: Tungsten oxide, Platinum, Photocatalyst, Photocatalytic activity, Visible light, Photodeposition, Spray deposition, Methylene blue

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