

PENGARUH KONSENTRASI Co(II) DAN SUHU KALSINASI TERHADAP KARAKTER Co-doped ZrO₂ SEBAGAI MODEL FOTOKATALIS RESPONSIF SINAR TAMPAK

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INTISARI

Sintesis dan karakterisasi *Co-doped* ZrO₂ sebagai model fotokatalis responsif terhadap sinar tampak telah dilakukan. Tujuan penelitian ini yaitu mempelajari pengaruh variasi konsentrasi garam Co sebagai sumber dopan dan variasi suhu kalsinasi. Zirkonia (ZrO₂) dan Co(NO₃)₂·6H₂O digunakan sebagai material awal. Proses sintesis diawali dengan mereaksikan ZrO₂ dan Co(NO₃)₂·6H₂O dengan variasi konsentrasi yaitu 1, 3, 5, 7 dan 9% (b/b) menggunakan metode refluks. Semua produk yang dihasilkan kemudian dikalsinasi pada suhu 700, 800, dan 900°C. Semua sampel kemudian dikarakterisasi dengan Difraktometer Sinar-X (XRD), Spektrofotometer Inframerah (FT-IR), Spektrofotometer UV-Vis *Diffuse Reflectance* (DR-UV), dan Spektrometer Fluoresensi Sinar-X (XRF).

Karakterisasi menggunakan XRD menunjukkan munculnya fasa kristal monoklin dengan intensitas tinggi pada *Co-doped* ZrO₂. Dari analisis XRF diketahui *Co-doped* ZrO₂ mengandung 0,56% Co sehingga dapat dibuktikan bahwa Co telah *terdoping* ke dalam ZrO₂. Hasil analisis FTIR menunjukkan berkurangnya serapan pada bilangan gelombang 501 dan 748 cm⁻¹ akibat terbentuknya ikatan Co-O-Zr. Melalui DR-UV diketahui sebagian besar hasil sintesis memiliki nilai E_g yang lebih kecil dari ZrO₂ non *doping* sehingga lebih responsif terhadap sinar tampak. Rentang nilai E_g dari *Co-doped* ZrO₂ yang diperoleh pada penelitian ini yaitu 2,990-3,218 eV. Nilai E_g paling kecil diperoleh pada *Co-doped* ZrO₂ 9% (b/b) pada suhu kalsinasi 900°C yaitu sebesar 2,990 eV dan pada panjang gelombang 419,8 nm.

Kata kunci : *Co-doped* ZrO₂, refluks, fotokatalis, garam Co(NO₃)₂·6H₂O

THE EFFECT OF Co(II) CONCENTRATION AND CALCINATION TEMPERATURE TOWARD CHARACTER OF Co-DOPED ZrO₂ AS A MODEL OF VISIBLE-LIGHT RESPONSIVE PHOTOCATALYST

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ABSTRACT

Synthesis and characterization of Co-doped ZrO₂ as a model of visible-responsive photocatalyst have been performed. The purpose of this research were studying the effect of various concentrations on the addition of Co salt as a dopant and various temperature used in calcination process. The zirconia (ZrO₂) and Co(NO₃)₂.6H₂O was used as starting materials. The synthesis process was initiated by the reaction of ZrO₂ with Co(NO₃)₂.6H₂O in various concentrations of 1, 3, 5, 7 and 9% (w/w) using reflux method. All resulted samples were calcined in temperature of 700, 800 and 900 °C, following by characterization with X-ray Diffractometer (XRD), Infrared Spectrophotometer (FT-IR), Diffuse Reflectance UV-Visible Spectrophotometer (DR-UV), and X-ray Fluorescence Spectrophotometer (XRF).

The XRD result showed a high intensity of monoclinic phase on Co-doped ZrO₂. In addition, XRF result showed that Co-doped ZrO₂ contain of 0.56% Co, so it had been proven that Co was successfully doped into ZrO₂. FT-IR analysis showed a reducing absorption on 501-748 cm⁻¹ corresponding to Co-O-Zr bonding formation. DR-UV analysis showed that mostly the synthesized Co-doped ZrO₂ have a lower value of band gap energy (E_g) in comparisson to that of non doped ZrO₂, so that it could be more responsive to visible light. Synthesized material samples have a band gap energy (E_g) in the range of 2.990-3.218 eV. The lowest E_g obtained in Co-doped ZrO₂ 9% (w/v) calcined in 900°C with a value 2.990 eV and wavelength of absorption 419.8 nm.

Keywords : Co-doped ZrO₂, reflux, photocatalyst, material Co(NO₃)₂.6H₂O