

SINTESIS Zn-DOPED ZrTiO₄ DENGAN VARIASI KONSENTRASI ZnCl₂ DAN SUHU KALSINASI SEBAGAI MODEL FOTOKATALIS RESPONSIF SINAR TAMPAK

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INTISARI

Sintesis dan karakterisasi Zn-doped ZrTiO₄ sebagai model fotokatalis responsif sinar tampak telah dilakukan. Penelitian ini bertujuan untuk melakukan sintesis material Zn-doped ZrTiO₄ menggunakan metode sol-gel, serta mengkaji pengaruh konsentrasi ZnCl₂ dan suhu kalsinasi terhadap karakter Zn-doped ZrTiO₄ hasil sintesis.

Prekursor titanium tetraisopropoksida (TTIP) yang dilarutkan ke dalam etanol direaksikan dengan suspensi ZrO₂ yang mengandung 1, 3, 5, 7, dan 9% (b/b Ti) dopan zink dari garam ZnCl₂. Material dengan konsentrasi ZnCl₂ optimum kemudian dikalsinasi dengan variasi suhu 500, 700, dan 900 °C. Seluruh sampel kemudian dikarakterisasi menggunakan *X-Ray Diffractometer* (XRD), *Scanning Electron Microscopy* dengan *Energy Dispersive X-Ray* (SEM-EDX), *Fourier Transform Infrared Spectrophotometer* (FT-IR) dan *Specular Reflectance UV-Visible Spectrophotometer* (SR-UV).

Hasil penelitian menunjukkan material Zn-doped ZrTiO₄ telah berhasil disintesis. Hasil analisis XRD menunjukkan kestabilan termal yang lebih baik pada Zn-doped ZrTiO₄ dibandingkan dengan Zn-doped TiO₂ jika dilihat dari proses perubahan fasa anatase ke rutil. Hasil SEM-EDX menunjukkan komposisi unsur Zr sebesar 31,16%, O sebesar 41,51%, Ti sebesar 26,39%, dan Zn sebesar 0,95%. Spektra FTIR menunjukkan perubahan intensitas ikatan Ti-O-Ti. Analisis SRUV menunjukkan penurunan nilai E_g yang paling optimum pada konsentrasi 5% (b/b) dari ZnCl₂ dengan suhu kalsinasi 900 °C. Nilai E_g optimum yaitu sebesar 2,87 eV pada panjang gelombang sinar tampak 432,37 nm.

Kata kunci: fotokatalis, sol-gel, titania, zink, zirkonia.

SYNTHESIS OF Zn-DOPED ZrTiO₄ WITH VARIOUS CONCENTRATIONS OF ZnCl₂ AND CALCINATION TEMPERATURES AS A MODEL OF VISIBLE LIGHT RESPONSIVE PHOTOCATALYST

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ABSTRACT

Synthesis and characterization of Zn-doped ZrTiO₄ as a model of visible light-responsive photocatalyst have been conducted. The main purpose of this research was to get Zn-doped ZrTiO₄ materials through sol-gel method and to learn the effect of concentration of ZnCl₂ and calcination temperature to Zn-doped ZrTiO₄ synthesis product.

Titanium tetraisopropoxide (TTIP) was added into ethanol and mixed by the ZrO₂ suspension which contained 1, 3, 5, 7 and 9% (w/w Ti) of zinc dopant from ZnCl₂ salts. The materials with optimum concentration of ZnCl₂ was calcined with various calcination temperatures 500, 700, and 900 °C. Prepared photocatalyst were characterized by using X-Ray Diffractometer (XRD), Scanning Electron Microscopy with Energy Dispersive X-Ray (SEM-EDX), Fourier Transform Infrared Spectrophotometer (FT-IR) and Specular Reflectance UV-Visible Spectrophotometer (SR-UV).

The results showed that the Zn-doped ZrTiO₄ materials was successfully synthesized. The XRD results showed that the character of Zn-doped ZrTiO₄ has better thermal stability than Zn-doped TiO₂ analyzed from the transformation phase of anatase to rutile. SEM-EDX results showed the composition of Zr 31.16%, O 41.51%, Ti 26.39%, and Zn 0.95%. FTIR spectra showed changes in intensity of Ti-O-Ti vibration in Zn-doped ZrTiO₄. SRUV showed that the optimum of bandgap energy (E_g) was on 5% of Zn dopant at a temperature 900 °C. The optimum band gap was 2.87 eV in the visible light wavelegth absorption at 432.37 nm.

Keywords: photocatalyst, sol-gel, titania, zirconia, zinc.