SINTESIS Co,N *BIDOPED* $ZrTiO_4$ SEBAGAI FOTOKATALIS RESPONSIF SINAR TAMPAK POTENSIAL DENGAN VARIASI KONSENTRASI Co DAN SUHU KALSINASI

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INTISARI

Sintesis dan karakterisasi Co,N *Bidoped* $ZrTiO_4$ sebagai model fotokatalis responsif terhadap sinar tampak telah dilakukan. Tujuan penelitian ini adalah mendapatkan material Co,N *Bidoped* $ZrTiO_4$ melalui metode sol-gel, mempelajari pengaruh variasi presentase $CoSO_4.7H_2O$, dan suhu kalsinasi pada material. Sintesis Co,N *Bidoped* $ZrTiO_4$ dengan metode sol-gel diawali dengan melarutkan titanium isopropoksida (TTIP) dalam etanol absolut yang kemudian direaksikan dengan ZrO_2, nitrogen dari urea dengan konsentrasi 10% (b/b)(N/Ti), dan $CoSO_4.7H_2O$ dengan konsentrasi 0, 1, 3, 5, 7, dan 9% (b/b)(Co/Ti). Variasi konsentrasi $CoSO_4.7H_2O$ di kalsinasi pada suhu 500 °C. 5% Co,N-*Bidoped* $ZrTiO_4$ di kalsinasi pada variasi suhu 500, 600, 700, 800, dan 900 °C. Material Co,N *Bidoped* ZrO_2 disintesis menggunakan metode refluks sebagai proses kontrol. Semua material tersintesis dikarakterisasi dengan *X-ray diffraction* (XRD), *scanning electron microscopy with energy dispersive X-ray* (SEM-EDX), *fouried transform infrared spectrophotometer* (FTIR), dan *specular reflectance UV-Visible spectrophotometer* (SRUV).

Hasil yang diperoleh menunjukkan bahwa sintesis Co,N *Bidoped* $ZrTiO_4$ melalui metode sol-gel berhasil dilakukan. Karakterisasi XRD menunjukkan bahwa fase kristal fotokatalis Co,N-*Bidoped* $ZrTiO_4$ didominasi oleh fase tetragonal dan anatas pada suhu 500 °C. ZrO_2 sebagai *supporting material* mampu meningkatkan kestabilan termal fotokatalis Co,N-*Bidoped* $ZrTiO_4$. Analisa SEM-EDX menunjukkan bahwa dopan Co dan N berhasil terdoping ke dalam kerangka $ZrTiO_4$. Spektra IR menunjukkan perubahan intensitas Ti-O. Analisa SRUV menunjukkan bahwa dopan Co dan N mampu menurunkan *band gap* TiO_2. Material dengan penambahan konsentrasi Co 3% dan suhu kalsinasi 500 °C memiliki *band gap* terendah (2.54 eV) dan panjang gelombang tepi absorpsi terpanjang (487 nm).

Kata kunci: Co,N *Bidoped* $ZrTiO_4$, fotokatalis, sol-gel, suhu kalsinasi, variasi konsentrasi

SYNTHESIS OF Co,N BIDOPED $ZrTiO_4$ AS POTENTIAL VISIBLE-LIGHT RESPONSIVE PHOTOCATALYST WITH VARIOUS Co CONCENTRATIONS AND CALCINATION TEMPERATURES

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ABSTRACT

Synthesis and characterization of Co,N Bidoped $ZrTiO_4$ as a model visible-light responsive photocatalyst has been done. The purpose of this research were to synthesis Co,N bidoped $ZrTiO_4$ material through sol-gel method, to study the effects of percentage variations of $CoSO_4.7H_2O$, and calcination temperature on material. Synthesis of Co,N bidoped $ZrTiO_4$ by sol gel method started with dissolving titanium isopropoxide (TTIP) in absolute ethanol, then reacted with ZrO_2, nitrogen from urea 10% (w/w)(N/Ti) and $CoSO_4.7H_2O$ with various concentration of 0, 1, 3, 5, 7, and 9% (w/w)(Co/Ti) . The variation concentration of $CoSO_4.7H_2O$ was calcined at 500 °C. 5% Co,N Bidoped $ZrTiO_4$ calcined with various calcination temperatures at 500, 600, 700, 800, and 900 °C. Co,N Bidoped ZrO_2 was synthesized by reflux method as control process. All synthesized materials were characterized by X-Ray diffraction (XRD), scanning electron microscopy with energy dispersive X-ray (SEM-EDX), fouried transform infrared spectrophotometer (FTIR), and specular reflectance UV-Visible spectrophotometer (SRUV).

The result obtained showed that Co,N *Bidoped* $ZrTiO_4$ was successfully synthesized by sol-gel methode. XRD Characterization showed that crytal phase of photocatalysts were dominated by tetragonal and anatase at 500 °C calcination termperature. ZrO_2 as supporting material enhanced termal stability of Co,N bidoped $ZrTiO_4$. SEM-EDX analysis showed dopan Co and N successfully doped into $ZrTiO_4$ framework. IR spectra showed intensity change in the absorption of Ti-O bond. SRUV analysis showed that Co and N dopan reduced band gap of TiO_2. Material with 3 wt.-% of Co concentration calcined at 500 °C has the lowest band gap (2.54 eV) and the longest absorption edge wavelength (487 nm).

Keywords: Co,N *Bidoped* $ZrTiO_4$, photocatalyst, sol-gel, calcination temperature, various concentration