

PENGARUH SUHU KALSINASI TERHADAP KARAKTER Co-DOPED TITANIUM DIOKSIDA DENGAN METODE SOL-GEL SEBAGAI MODEL FOTOKATALIS RESPONSIF SINAR TAMPAK

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INTISARI

Telah dipelajari pengaruh suhu kalsinasi terhadap karakter *Co-doped* TiO₂ dengan metode *sol-gel* sebagai model fotokatalis responsif sinar tampak. Tujuan penelitian ini untuk mengetahui struktur fasa kristal dan responsivitas terhadap sinar tampak material *Co-doped* TiO₂ akibat pengaruh suhu kalsinasi dengan metode *sol-gel*. Prekursor TiO₂ dibuat dengan cara melarutkan Ti(OCH(CH₃)₂)₄ (TTIP) dengan etanol. Prekursor logam dopan dibuat dengan melarutkan Co(NO₃)₂·6H₂O dengan akuabides. Prekursor TiO₂ dan prekursor logam Co²⁺ direaksikan dalam *sonicbath*. Hasil serbuk *Co-doped* TiO₂ dikalsinasi pada suhu 300, 400, 500, 600 dan 700 °C. Material TiO₂ 0% tanpa adanya *doping* logam Co²⁺ dijadikan sebagai variable kontrol. Sampel di karakterisasi dengan *Fourier Transform Infrared Spectrophotometer* (FT-IR), *Specular Reflectance UV-Vis Spectrophotometer* (SR-UV), *X-Ray Diffractometer* (XRD) dan *X-Ray Fluorescence Spectrophotometer* (XRF).

Hasil analisis XRD menunjukkan adanya puncak anatas kalsinasi suhu 600 °C pada 2θ= 24,58° dan rutil pada kalsinasi suhu 600 °C pada 2θ= 26,72; 53,66° dan 700 °C pada 2θ= 26,72; 35,38 dan 53,67°. Analisis dengan FT-IR menunjukkan bahwa serapan Ti-O-Ti pada bilangan gelombang 400-700 cm⁻¹ berkurang. Analisis dengan XRF menunjukkan komposisi logam kalsinasi suhu 600 °C Ti= 91,79%, Co= 5,96% dan kalsinasi suhu 700 °C Ti= 89,37%, Co= 8,25%. Analisis dengan SR-UV menunjukkan adanya pergeseran panjang gelombang tepi ke arah panjang gelombang yang lebih besar (*red shift*), sehingga pada kalsinasi suhu 600 °C harga energi celah pitanya 3,02 eV dan kalsinasi suhu 700 °C adalah 2,97 eV.

Kata kunci : *Co-doped* TiO₂, fotokatalis, metode *sol-gel*, suhu kalsinasi.

EFFECT OF CALCINATION TEMPERATURE TOWARDS CHARACTERS OF Co-DOPED TITANIUM DIOXIDE BY SOL-GEL METHOD AS A MODEL OF VISIBLE LIGHT RESPONSIVE PHOTOCATALYST

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ABSTRACT

Synthesis of Co-doped TiO₂ by sol-gel method and its characterization have been conducted. The purpose of this research were to study the effect of calcination temperature in the synthesis of Co-doped TiO₂ by sol-gel method to identify the crystal structure of Co-doped TiO₂ and respositivity to visible-light due to the effect of calcination temperature. Co-doped TiO₂ was made by mixing Ti(OCH(CH₃)₂)₄ (TTIP) with ethanol and Co(NO₃)₂·6H₂O with the concentration of 5% (w/w) in sonicbath. Co-doped TiO₂ powder then calcinated in various temperature of 300, 400, 500, 600 and 700 °C. All samples were characterized with Fourier Transform Infrared Spectrophotometer (FT-IR), Specular Reflectance UV-Visible Spectrophotometer (SR-UV), X-Ray Diffractometer (XRD) and X-Ray Flouresence Spectrophotometer (XRF).

The XRD analysis results of Co-doped TiO₂ samples calcined at 600 and 700 °C showed the characteristic of anatase phase at 2θ= 24.58°. It also known that Co-doped TiO₂ samples calcined at 600 and 700 °C had characteristic of rutile phase at 2θ= 26.72; 53.66 and 26.72; 35.38; 53.67°, respectively. The FT-IR analysis showed that calcination reduce absorption Ti-O-Ti at wavenumbers of 400-700 cm⁻¹. The XRF analysis showed that Co-doped TiO₂ sample calcined at 600 and 700 °C contain of 91.79 and 89.37% Ti, 5.96 and 8.25% Co, respectively. The SR-UV analysis showed bathochromic shift in Co-doped TiO₂ samples calcined at 600 and 700 °C, so each sample have band gap energy of 3.02 and 2.97 eV.

Key words: Co-doped TiO₂, photocatalyst, sol-gel method, calcination temperature.