

## SINTESIS Cu, N-CODOPED ZrTiO<sub>4</sub> SEBAGAI MODEL FOTOKATALIS RESPONSIF SINAR TAMPAK DENGAN VARIASI KONSENTRASI CuSO<sub>4</sub> DAN SUHU KALSINASI

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### INTISARI

Sintesis dan karakterisasi Cu,N-codoped ZrTiO<sub>4</sub> sebagai model fotokatalis responsif sinar tampak telah dilakukan. Tujuan dari penelitian ini adalah untuk menganalisis pengaruh konsentrasi Cu dan N sebagai dopan dan suhu kalsinasi dari material fotokatalis Cu,N-codoped ZrTiO<sub>4</sub> yang responsif pada sinar tampak. Metode yang digunakan adalah metode *sol-gel*. Penelitian ini diawali dengan larutan titanium tetraisoprosida (TTIP) yang dilarutkan dalam etanol absolut. Kemudian dicampurkan dengan campuran ZrO<sub>2</sub>, urea 10 % (b/b) dan garam CuSO<sub>4</sub>.5H<sub>2</sub>O (1, 3, 5, 7 dan 9 % (b/b)). Setelah itu dilakukan kalsinasi dengan variasi suhu 500, 700 dan 900 °C. Hasil sintesis kemudian dikarakterisasi menggunakan *Fourier-Transform Infrared Spectroscopy* (FTIR), *Specular Reflectance UV-Vis* (SR-UV), *X-Ray Diffraction* (XRD) dan *Scanning Electron Microscopy with Energy Dispersive X-Ray* (SEM-EDX).

Hasil menunjukkan bahwa sintesis Cu,N-codoped ZrTiO<sub>4</sub> telah berhasil disintesis. Karakterisasi menunjukkan adanya struktur kristal tetragonal dan fase anatas yang dominan pada variasi konsentrasi serta mulai munculnya fase rutil pada suhu kalsinasi 700 °C. Analisis dengan SEM-EDX mengindikasikan Cu dan N telah terdoping pada material ZrTiO<sub>4</sub>. Spektra IR menunjukkan adanya vibrasi Cu-O-Zr dan O-Ti-N. Sampel Cu,N-codoped ZrTiO<sub>4</sub> memiliki nilai energi celah pita terendah sebesar 2,67 eV yang diperoleh pada konsentrasi Cu 1 % dengan suhu kalsinasi 500 °C dan panjang gelombang daerah sinar tampak 464 nm.

Kata kunci: Cu,N-codoped ZrTiO<sub>4</sub>, fotokatalis, sol gel, suhu kalsinasi, variasi konsentrasi

## **SYNTHESIS OF Cu, N-CODOPED ZrTiO<sub>4</sub> AS A MODEL OF VISIBLE-LIGHT RESPONSIVE PHOTOCATALYST WITH VARIOUS CONCENTRATIONS OF CuSO<sub>4</sub> AND CALCINATION TEMPERATURES**

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### **ABSTRACT**

Synthesis and characterization of Cu,N-codoped ZrTiO<sub>4</sub> as a model visible light-responsive photocatalyst has been done. The purpose of this study was to analyze the effects of Cu and N concentrations as dopants and the calcination temperature of the photocatalyst material Cu,N-codoped ZrTiO<sub>4</sub> photocatalyst material which is responsive to visible light. The method used was the sol-gel method. This research started with a solution of titanium(IV) isopropoxide dissolved in absolute ethanol. Then mixed with a mixture of ZrO<sub>2</sub>, urea 10 % (w/w) and CuSO<sub>4</sub>.5H<sub>2</sub>O salt (1, 3, 5, 7 and 9 % (w/w)). After that, calcination was carried out with temperature variations of 500, 700 and 900 °C. The synthesis results were then characterized using Fourier-Transform Infrared Spectroscopy (FTIR), Specular Reflectance UV-Vis (SR-UV), X-Ray Diffraction (XRD) and Scanning Electron Microscopy with Energy Dispersive X-Ray (SEM-EDX).

The results showed that Cu,N-codoped ZrTiO<sub>4</sub> was successfully synthesized. Characterization showed the presence of a dominant tetragonal crystal structure and an anatase phase at various concentrations and the rutile phase began to appear at a calcination temperature of 700 °C. SEM-EDX analysis shows that Cu and N have been doped on the ZrTiO<sub>4</sub> material. The IR spectra showed the presence of Cu-O-Zr and O-Ti-N. Sample Cu,N-codoped ZrTiO<sub>4</sub> with lowest bandgap ( $E_g = 2.67$  eV) was obtained at 1 wt.-% of Cu content after calcination at 500 °C and the visible light wavelength is 464 nm.

Keywords: Cu,N-codoped ZrTiO<sub>4</sub>, photocatalyst, sol gel, calcination temperature, various concentration