

**PENGARUH VARIASI KANDUNGAN Zn DALAM FOTOKATALIS
 $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$ TERHADAP AKTIVITAS FOTOKATALISIS
DEGRADASI BIRU METILEN (*METHYLENE BLUE-MB*)**

LUSIANA DWI SETIYA RINI
18/430305/PA/18818

INTISARI

Preparasi $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$ sebagai fotokatalis untuk degradasi biru metilen (*Methylene Blue-MB*) telah dilakukan. Tujuan penelitian ini untuk mempelajari karakter fotokatalis $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$ serta variasi konsentrasi Zn dan pengaruh variasi pH, massa fotokatalis, dan waktu kontak terhadap aktivitas degradasi MB. Preparasi Fe_3O_4 dilakukan menggunakan metode sonokimia dan kopresipitasi kemudian dilakukan pelapisan SiO_2 dan TiO_2 menggunakan metode *sol-gel*. Penambahan $\text{Zn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ sebagai prekursor Zn dilakukan menggunakan metode *sol-gel* dengan variasi konsentrasi Zn (1%, 3%, 5%, dan 7%). Fotokatalis $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$ dikalsinasi selama 3 jam pada suhu 500 °C. Fotokatalis dikarakterisasi menggunakan FT-IR, XRD, TEM, SEM-EDX, dan SR-UV. Uji fotokatalisis MB dilakukan pada variasi pH MB (8, 9, 10, 11, dan 12), massa fotokatalis (10,0; 20,0; 30,0; 40,0; dan 50,0 mg) dan waktu kontak (15, 30, 45, 60, dan 75 menit).

Hasil penelitian menunjukkan bahwa $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$ telah berhasil dipreparasi dibuktikan dengan hasil karakterisasi FTIR yang menunjukkan adanya ikatan Fe-O, Si-O-Si, serta Ti-O didukung dengan hasil XRD yang menunjukkan puncak dari Fe_3O_4 , amorf SiO_2 , serta TiO_2 anatase. Hasil SEM-EDX menunjukkan morfologi permukaan $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$ berupa partikel berbentuk bulat. Fotokatalis $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$ bersifat magnetik karena dapat dipisahkan dari media cair menggunakan magnet eksternal. Penambahan logam Zn menyebabkan fotokatalis responsif terhadap sinar tampak. Aktivitas fotokatalisis degradasi MB optimum sebesar 86,8% di bawah paparan sinar tampak dan 66,5% dibawah sinar UV dicapai pada kondisi pH larutan 11, massa fotokatalis 30,0 mg, dan waktu kontak 30 menit menggunakan fotokatalis $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$ 5%.

Kata kunci: biru metilen, $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$, fotodegradasi.

THE EFFECT OF VARIATION Zn CONTENT IN $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$ PHOTOCATALYST ON THE PHOTOCATALYSIS ACTIVITY OF METHYLENE BLUE-MB DEGRADATION

LUSIANA DWI SETIYA RINI
18/430305/PA/18818

ABSTRACT

The preparation of $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$ as a photocatalyst for methylene blue (MB) degradation has been carried out. The purpose of this research is to study the effect of Zn concentration on the character of $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$ photocatalyst and the effect of pH, photocatalyst weight, and irradiation time on the optimum activity of $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$ photocatalyst in MB degradation reaction. The preparation was initiated with Fe_3O_4 preparation through sonochemical and coprecipitation methods and then coating with SiO_2 and TiO_2 using the sol-gel method. The addition of $\text{Zn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ as a Zn precursor was carried out using the sol-gel method with varying Zn concentrations (1%, 3%, 5% and 7%). $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$ photocatalyst was calcined for 3 hours at 500 °C. The photocatalysts were characterized using FT-IR, XRD, TEM, SEM-EDX Mapping and SR-UV. MB photocatalysis tests were conducted at varying pH (8, 9, 10, 11 and 12), photocatalyst mass (10.0; 20.0; 30.0; 40.0 and 50.0 mg), and contact time (15, 30, 45, 60 and 75 min).

The results showed that $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$ had been prepared successfully with the FTIR characterization showing the presence of Fe-O, Si-O-Si, and Ti-O bonds supported by XRD results showing peaks of Fe_3O_4 , amorphous SiO_2 , and anatase TiO_2 . SEM-EDX results show the surface morphology of $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$ particles is spherical. The $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$ photocatalyst is magnetic because it can be separated from the liquid medium using an external magnet. The addition of Zn metal causes the photocatalyst to be responsive to visible light. The activity photocatalytic of MB degradation was optimum at 86.8% under visible light and 66.5% under UV light at solution pH 11, photocatalyst mass 30.0 mg, and contact time 30 min using $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$ 5% photocatalyst.

Keywords: $\text{Fe}_3\text{O}_4/\text{SiO}_2/\text{TiO}_2\text{-Zn}$, methylene blue, photodegradation.