

PENINGKATAN EFEKTIVITAS FOTODEGRADASI ZAT WARNA KONGO MERAH TERKATALIS TiO₂ DENGAN DOPING LOGAM Fe DARI LIMBAH KARAT BESI PADA SINAR TAMPAK

Ibanez Rosesya Cinjana
(20/466463/PPA/06029)

INTISARI

Doping atom Fe dari limbah karat besi pada TiO₂ untuk fotodegradasi kongo merah di bawah paparan sinar tampak telah berhasil dilakukan. Preparasi dilakukan melalui metode sol-gel dengan rasio perbandingan mmol TiO₂:Fe (1:0,01; 1:0,02; 1:0,03; 1:0,06; dan 1:0,12). Karakterisasi TiO₂ terdoping Fe (TiO₂/Fe) dilakukan dengan *Fourier Transform Infrared Spectroscopy* (FTIR), *X-Ray Diffraction* (XRD), *UV-Vis Diffuse Reflectance Spectroscopy* (SRUV), *Transmission Electron Microscopy* (TEM), dan *Energy Dispersive X-Ray Spectrometer* (EDX). Aktivitas fotokatalitik dievaluasi melalui fotodegradasi zat warna kongo merah di bawah kondisi sinar tampak dengan optimasi perbandingan mmol TiO₂/Fe, pH, waktu penyinaran, massa fotokatalis, dan konsentrasi awal zat warna. Data karakterisasi menunjukkan bahwa doping TiO₂ dengan atom Fe dari limbah besi berkarat secara nyata mempersempit celah, sehingga menggeser degradasi ke daerah tampak. Penurunan Eg maksimal dari 3,2 eV menjadi 2,5 eV ditunjukkan oleh fotokatalis TiO₂/Fe (1:0,12). Hasil uji aktivitas terhadap zat warna kongo merah paling tinggi ditunjukkan pada fotokatalis TiO₂/Fe (1:0,06) dengan kondisi pH 5, massa fotokatalis 60 mg, waktu penyinaran 60 menit, dan konsentrasi awal zat warna sebesar 5 ppm.

Kata kunci: TiO₂, TiO₂/Fe, karat besi, kongo merah, sinar tampak.

***INCREASING THE EFFECTIVENESS OF THE PHOTODEGRADATION OF
CONGO RED CATALYZED BY TiO₂ DOPED Fe FROM RUSTED IRON
WASTE UNDERVISIBLE LIGHT***

Ibanez Rosesya Cinjana
(20/466463/PPA/06029)

ABSTRACT

The doping of Fe atoms from rusted iron waste on TiO₂ for photodegradation of congo red under visible light has been successfully carried out. The photocatalyst was prepared by sol-gel method with a millimole ratio of TiO₂:Fe (1:0.01, 1:0.02, 1:0.03, 1:0.06, and 1:0.12). The Fe-doped TiO₂ (TiO₂/Fe) obtained was analyzed by Fourier Transform Infrared Spectroscopy (FTIR), X-Ray Diffraction (XRD), UV-Vis Diffuse Reflectance Spectroscopy (SRUV), Transmission Electron Microscopy (TEM), and Energy Dispersive X-Ray Spectrometer (EDX) instruments. The photocatalytic activity was evaluated by photodegradation of Congo red dye under visible light conditions by optimizing the TiO₂/Fe millimole ratio, pH, reaction time, photocatalyst mass, and initial concentration of dye. The characterization data showed that doping TiO₂ with Fe atom from rusted iron waste has noticeably narrowed the band gap (E_g) that shifted the degradation into the visible region. The maximum decrease in E_g from 3.2 eV to 2.5 eV was shown by the TiO₂/Fe (1:0.12) photocatalyst. The highest photodegradation of congo red was shown in TiO₂/Fe (1:0.06) at pH 5, 40 mg of photocatalyst mass, 60 min reaction time, and 5 ppm of the initial dye concentration.

Keywords: TiO₂, TiO₂/Fe, rusted iron, congo red, visible light irradiation.