

Sintesis dan karakterisasi struktur, sifat optis dan aktivitas fotokatalitik dari nanopartikel ZnO:Fe/SDS = Synthesis and characterization of structure optical properties and photocatalytic activity of ZnO:Fe/ SDS nanoparticles

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Abstrak

Nanopartikel ZnO:Fe/SDS dengan empat variasi konsentrasi Fe telah disintesis menggunakan metode kopresipitasi. Struktur dan sifat optis dari nanopartikel dikarakterisasi menggunakan Energy Dispersive X-Ray (EDX), X-Ray Diffraction (XRD), Electron Spin Resonance (ESR), Field Emission - Scanning Electron Microscope (FESEM), Fourier Transform-Infrared (FTIR), dan spektroskopi UV-Vis. Aktivitas fotokatalitik nanopartikel diuji melalui degradasi Methyl Orange (MO) dan Methylene Blue (MB) di bawah sinar UV. Nanopartikel yang diperoleh memiliki fase tunggal dengan struktur heksagonal wurtzite. Untuk konsentrasi dopan 11 at. % terdapat fase tambahan berupa ZnFe₂O₄ yang menunjukkan batas solubilitas Fe dalam menggantikan Zn pada kisi ZnO. Aktivitas fotokatalitik mengalami peningkatan saat konsentrasi Fe meningkat berkaitan dengan terbentuknya trapping site di gap nanopartikel. Nanopartikel ZnO:Fe/SDS menunjukkan aktivitas fotokatalitik yang lebih tinggi dalam mendegradasi MB dibandingkan MO berkaitan dengan interaksi elektrostatik antara SDS dan dyes.

.....ZnO:Fe/SDS nanoparticles with four varies of Fe concentration were prepared by coprecipitation methods. Structural and optical properties of nanoparticles were characterized using Energy Dispersive X-Ray (EDX), X-Ray Diffraction (XRD), Electron Spin Resonance (ESR), Field Emission - Scanning Electron Microscope (FE-SEM), Fourier Transform-Infrared (FTIR), and UV-Vis Spectroscopy. The photocatalytic activity were evaluated by observing the photodegradation of Methyl Orange (MO) and Methylene Blue (MB) under UV light irradiation. The nanoparticles had single phases with hexagonal wurtzite structure. Sample ZnO:Fe/SDS 11 at. % showed the secondary phase of ZnFe₂O₄ which shown the solubility limit of Fe substituted Zn in ZnO system. The photocatalytic of nanoparticles increased as the Fe doping concentration increased due to forming trapping site in band gap. ZnO:Fe/SDS nanoparticles showed higher photocatalytic activity in photodegradation of MB than MO due to electrostatic forced between SDS and dyes.