

**SINTESIS DAN KARAKTERISASI SIFAT OPTIK DAN
MAGNETIK NANOKOMPOSIT $\text{Fe}_3\text{O}_4@ZnO:C$**

SKRIPSI



**DEPARTEMEN FISIKA
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
UNIVERSITAS ANDALAS
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ABSTRAK

Penelitian ini bertujuan untuk menganalisis pengaruh variasi massa karbon terhadap sifat optik dan magnetik nanokomposit $\text{Fe}_3\text{O}_4@\text{ZnO}:\text{C}$. Nanokomposit $\text{Fe}_3\text{O}_4@\text{ZnO}:\text{C}$ disintesis menggunakan metode kopresipitasi dengan variasi sampel yaitu Fe_3O_4 , $\text{Fe}_3\text{O}_4@\text{ZnO}$ (1:2), $\text{Fe}_3\text{O}_4@\text{ZnO}:\text{C}$ (0,2 g), $\text{Fe}_3\text{O}_4@\text{ZnO}:\text{C}$ (0,1 g), dan $\text{Fe}_3\text{O}_4@\text{ZnO}:\text{C}$ (0,05 g). Sampel kemudian dikarakterisasi menggunakan *x-ray diffraction* (XRD), *fourier transform Infrared* (FTIR), *photoluminescence* (PL), dan *vibrating sample magnetometer* (VSM). Ukuran kristal yang diperoleh dari hasil karakterisasi XRD berturut-turut yaitu 20,39 nm; 27,22 nm; 20,39 nm; 16,31 nm; dan 16,31 nm. Hasil pengujian FTIR terdapat ikatan Fe-O dan Zn-O yang mengindikasikan terbentuknya Fe_3O_4 dan ZnO. Ikatan C-O, C-H, dan O-H menandakan terdapatnya lapisan karbon yang bersumber dari glukosa. Hasil karakterisasi PL menunjukkan bahwa penambahan karbon akan meningkatkan intensitas fotoluminisensi dari nanokomposit $\text{Fe}_3\text{O}_4@\text{ZnO}:\text{C}$. Dari pengujian dengan VSM diperoleh sifat magnetik nanokomposit $\text{Fe}_3\text{O}_4@\text{ZnO}:\text{C}$ yaitu superparamagnetik. Semakin sedikit massa karbon yang digunakan maka nilai saturasi magnetik (M_s) semakin tinggi, dimana nilai saturasi magnetik masing-masing variasi massa karbon 0,2 g, 0,1 g, dan 0,05 g yaitu 18,23 emu/g, 19,33 emu/g, dan 22,05 emu/g. Berdasarkan hasil karakterisasi ini, material nanokomposit $\text{Fe}_3\text{O}_4@\text{ZnO}:\text{C}$ berpotensi sebagai material pengontras.

Kata kunci: $\text{Fe}_3\text{O}_4@\text{ZnO}$, karbon, kopresipitasi, sifat magnetik, sifat optik



SYNTHESIS AND CHARACTERIZATION OF OPTICAL AND MAGNETIC PROPERTIES OF $\text{Fe}_3\text{O}_4@\text{ZnO}:\text{C}$ NANOCOMPOSITES

ABSTRACT

This study aimed to analyze the effect of variations in carbon mass on the optical and magnetic properties of the $\text{Fe}_3\text{O}_4@\text{ZnO}:\text{C}$ nanocomposite. The $\text{Fe}_3\text{O}_4@\text{ZnO}:\text{C}$ nanocomposites were synthesized using the coprecipitation method with a variety of samples, namely Fe_3O_4 , $\text{Fe}_3\text{O}_4@\text{ZnO}$ (1:2), $\text{Fe}_3\text{O}_4@\text{ZnO}:\text{C}$ (0.2 g), $\text{Fe}_3\text{O}_4@\text{ZnO}:\text{C}$ (0.1 g), and $\text{Fe}_3\text{O}_4@\text{ZnO}:\text{C}$ (0.05 g). The samples were then characterized using x-ray diffraction (XRD), fourier transform infrared (FTIR), photoluminescence (PL), and vibrating sample magnetometer (VSM). The crystal size obtained from the XRD characterization results were 20.39 nm; 27.22 nm; 20.39 nm; 16.31 nm; and 16.31 nm. The results of the FTIR test showed Fe-O and Zn-O bonds which indicate the formation of Fe_3O_4 and ZnO. The C-O, C-H, and O-H bonds indicate the presence of a carbon layer originating from glucose. PL characterization results showed that the addition of carbon would increase the photoluminescence intensity of the $\text{Fe}_3\text{O}_4@\text{ZnO}:\text{C}$ nanocomposite. From testing with VSM obtained the magnetic properties of the $\text{Fe}_3\text{O}_4@\text{ZnO}:\text{C}$ nanocomposite which is superparamagnetic. The less mass of carbon used, the higher the magnetic saturation value (M_s), where the magnetic saturation value of each variation of carbon mass 0.2 g, 0.1 g, and 0.05 g is 18.23 emu/g, 19.33 emu/g, and 22.05 emu/g. Based on the results of this characterization, the $\text{Fe}_3\text{O}_4@\text{ZnO}:\text{C}$ nanocomposite material has the potential as a contrast material.

Keywords: $\text{Fe}_3\text{O}_4@\text{ZnO}$, carbon, coprecipitation, magnetic properties, optical properties

