Pengaruh Penambahan Material Graphene terhadap Karakteristik Nanokomposit BiFeO3/LaFeO3 dan Aplikasi Photocatalytic untuk Degradasi Methylene Blue = Effect of Graphene to the Characterization of BiFeO3/LaFeO3 composites and Its Photocatalytic Application for Methylene Blue Degradation

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Abstrak

Nanokomposit BiFeO3/LaFeO3 dan BiFeO3/LaFeO3/Graphene dengan variasi persen berat (wt.%) graphene sebanyak 3, 5, dan 10 wt.% telah berhasil difabrikasi menggunakan metode berbantuan ultrasonik. Tidak adanya pengotor dan fasa lain pada nanokomposit ditunjukkan dari hasil karakterisasi X-ray Diffraction (XRD) dan X-ray Fluorescence (XRF). Keberadaan material graphene dan interaksinya dengan nanokomposit BiFeO3/LaFeO3 yang tidak terdeteksi oleh pengukuran XRD dan XRF dapat dilihat dengan jelas melalui pengukuran X-ray Photoelectron Spectroscopy (XPS), Thermogravimetric Analysis (TGA), dan Raman Spectroscopy. Pengukuran UV-Vis Diffuse Reflectance Spectroscopy (UV-Vis DRS) menunjukkan bahwa energi celah pita berkurang karena adanya material graphene. Kehadiran grafena sangat terlihat pengaruhnya pada hasil pengukuran isoterm adsorpsi-desorpsi N2 yang ditandai dengan peningkatan luas permukaan yang drastis dan perubahan bentuk pori-pori permukaan. Nanokomposit BiFeO3/LaFeO3/Graphene menunjukkan aktivitas fotokatalitik yang lebih unggul dibandingkan dengan BiFeO3, LaFeO3, dan BiFeO3/LaFeO3 pada paparan cahaya tampak. Uji reusability menunjukkan stabilitas nanokomposit pada penggunaan berulang sebanyak 4 kali.

.....BiFeO3/LaFeO3 and BiFeO3/LaFeO3/Graphene nanocomposites with variations in weight percent (wt.%) graphene as much as 3, 5, and 10 wt.% have been successfully fabricated using ultrasonic-assisted methods. The absence of impurities and other phases in the nanocomposite was shown from the results of X-ray Diffraction (XRD) and X-ray Fluorescence (XRF) characterization. The presence of graphene material and its interactions with BiFeO3/LaFeO3 nanocomposites that were not detected by XRD and XRF measurements could be clearly seen through X-ray Photoelectron Spectroscopy (XPS), Thermogravimetric Analysis (TGA), and Raman Spectroscopy measurements. Measurement of UV-Vis Diffuse Reflectance Spectroscopy (UV-Vis DRS) showed that the band gap energy was reduced due to the presence of graphene material. The presence of graphene has a very visible effect on the measurement results of the N2 adsorption-desorption isotherm which is characterized by a drastic increase in surface area and a change in the shape of the surface pores. BiFeO3/LaFeO3/Graphene nanocomposite showed superior photocatalytic activity compared to BiFeO3, LaFeO3, and BiFeO3/LaFeO3 on exposure to visible light. The reusability test showed the stability of the nanocomposite on repeated use 4 times.