

## INTISARI

### **GREEN SYNTHESIS NANOKOMPOSIT Fe<sub>3</sub>O<sub>4</sub>/rGO MENGGUNAKAN EKSTRAK TANAMAN DAN APLIKASINYA UNTUK FOTODEGRADASI LIMBAH**

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Degradasi limbah larutan pewarna *Methylene Blue* (MB) menggunakan fotokatalis nanokomposit magnetik Fe<sub>3</sub>O<sub>4</sub>/rGO (magnetit/*reduced graphene oxide*) telah berhasil dilakukan. Nanokomposit disintesis dengan metode *green synthesis* memanfaatkan ekstrak daun *Moringa oleifera* dan *Amaranthus viridis*. Sampel Fe<sub>3</sub>O<sub>4</sub>/rGO dikarakterisasi menggunakan *X-Ray Diffractometer* (XRD), *Fourier Transform Infra-Red*, dan spektrofotometer *UV-Vis*. Hasil karakterisasi XRD menunjukkan struktur kristal *face-centered cubic inverse spinel magnetite* dengan ukuran kristalit sebesar (11,8 ± 0,3) nm. Analisis FTIR Fe<sub>3</sub>O<sub>4</sub>/rGO mengonfirmasi terbentuknya nanokomposit Fe<sub>3</sub>O<sub>4</sub>/rGO dengan munculnya gugus fungsi Fe–O dan C=C. Spektrum absorbansi dari spektrofotometri *UV-Vis* nanokomposit menunjukkan energi celah pita sebesar 3,26 eV. Aktivitas fotokatalitik pada degradasi limbah MB dengan variasi massa fotokatalis semakin besar menunjukkan pengaruh pada persentase degradasi. Variasi massa tertinggi merupakan massa efektif dalam proses degradasi MB selama 120 menit dan mencapai persentase degradasi hingga 77,07%.

**Kata kunci:** degradasi, fotokatalis, *green synthesis*, *methylene blue*, nanokomposit.

## ABSTRACT

### GREEN SYNTHESIS OF Fe<sub>3</sub>O<sub>4</sub>/rGO USING LEAF EXTRACTS AND ITS APPLICATION IN WASTE PHOTODEGRADATION

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The degradation of Methylene Blue dye using the Fe<sub>3</sub>O<sub>4</sub>/rGO magnetic nanocomposite has been successfully carried out. The nanocomposite was synthesized using the green synthesis method utilizing *Moringa oleifera* and *Amaranthus viridis* leaf extracts. Fe<sub>3</sub>O<sub>4</sub>/rGO is then characterized using X-Ray Diffractometer (XRD), Fourier Transform Infra-Red, and UV-Vis spectrophotometer. XRD showed a crystal structure of face-centered cubic inverse spinel magnetite with the crystallite size of  $(11,8 \pm 0,3)$  nm. FTIR result showed the nanocomposite has been successfully synthesized, confirmed by the appearance of Fe–O and C=C function groups. The absorbance spectra from Uv-Vis spectrophotometry gives the band gap energy of 3,26 eV. The photocatalytic activity of the MB dye waste degradation with the increasing photocatalyst mass variations of 0,01; 0,03; 0,05; 0,07; and 0,09 grams affect the degradation degree. The effective mass of the photocatalyst variation was 0,09 grams, resulting in up to 77,07% removal of MB under UV light for 120 minutes.

**Keywords:** degradation, green synthesis, methylene blue, nanocomposite, photocatalyst.