

**GREEN SYNTHESIS NANOMATERIAL MAGNETIK NiFe_2O_4 SECARA
HIDROTERMAL MENGGUNAKAN EKSTRAK *Aloe vera* DAN
PENERAPAN SIFAT KATALITIKNYA DALAM DEGRADASI ZAT
WARNA *DIRECT RED 81***

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ABSTRACT

GREEN SYNTHESIS OF NiFe_2O_4 MAGNETIC NANOMATERIAL USING *Aloe vera* EXTRACT BY HYDROTHERMAL METHOD AND ITS APPLICATION IN DEGRADATION OF *DIRECT RED 81* DYE

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In this research, the synthesis of NiFe_2O_4 (NiN+E, NiE, and NiN) magnetic materials have been carried out by hydrothermal method using *Aloe vera* extract. NiN+E was synthesized by hydrothermal method using *Aloe vera* extract and the addition of NaOH to pH 12, NiE used *Aloe vera* extract without the addition of NaOH, and NiN the addition of NaOH to pH 12 without *Aloe vera* extract. XRD patterns of NiN+E and NiN exhibited a characteristic of NiFe_2O_4 cubic while the XRD patterns of NiE showed an impurity characteristic of $\alpha\text{-Fe}_2\text{O}_3$. VSM analysis showed NiN+E and NiN were soft ferromagnetic with M_s values of 45.00 and 63.28 emu/g, respectively. The value of M_s NiN was high indicating the characteristic of bulk compound formation and the presence of $\alpha\text{-Fe}_2\text{O}_3$ impurity. TEM image showed the average particle size of NiN+E was 67-145 nm. UV-Vis DRS analysis showed that NiN+E had catalytic activity in the visible light region with E_g values of 1.68 eV. FT-IR analysis showed the presence of Fe-O and Ni-O vibrations at 452 and 558 cm^{-1} . The photocatalytic activity of NiN+E was better compared with NiN in degrading *Direct Red 81* dye. NiN+E was able to degrade *Direct Red 81* 40 mg/L by 92.82% while NiN was 87.03%.

Keywords: NiFe_2O_4 Magnetic Material, Hydrothermal, Ferromagnetic, Photocatalytic, *Direct Red 81*

