GREEN SYNTHESIS NANOMATERIAL MAGNETIK NiFe₂O₄ 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$_2$O$_4$ 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$_2$O$_4$ (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$_2$O$_4$ cubic while the XRD patterns of NiE showed an impurity characteristic of α-Fe$_2$O$_3$. VSM analysis showed NiN+E and NiN were soft ferromagnetic with Ms values of 45.00 and 63.28 emu/g, respectively. The value of Ms NiN was high indicating the characteristic of bulk compound formation and the presence of α-Fe$_2$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 Eg 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$_2$O$_4$ Magnetic Material, Hydrothermal, Ferromagnetic, Photocatalytic, Direct Red 81