

SYNTHESIS OF $\text{Fe}_3\text{O}_4/\text{ZnO-Ni}$ COMPOSITE AS A CATALYST FOR PHOTOCATALYTIC DEGRADATION OF TETRACYCLINE

Putri Rembulan Kencana
18/424235/PA/18340

ABSTRACT

Synthesis of $\text{Fe}_3\text{O}_4/\text{ZnO-Ni}$ composite for catalytic degradation of tetracycline has been carried out. The aims of this research were to obtain $\text{Fe}_3\text{O}_4/\text{ZnO-Ni}$ photocatalyst material which has photocatalytic activity under visible light exposure and has magnetic properties so therefore it can be easily separated from liquid medium. The research started with the synthesis of magnetite (Fe_3O_4) material by using sono-coprecipitation method followed by the coating of ZnO on Fe_3O_4 with mole ratio of $\text{Fe}_3\text{O}_4:\text{ZnO}$ 1:6 to form $\text{Fe}_3\text{O}_4/\text{ZnO}$ material. The synthesis was continued by adding nickel (Ni) dopant to the $\text{Fe}_3\text{O}_4/\text{ZnO}$ material to obtain $\text{Fe}_3\text{O}_4/\text{ZnO-Ni}$ composite. The synthesized materials were characterized using FT-IR, XRD, SEM-EDX, TEM, VSM, and SR-UV/Vis. The examination of the activity of the photocatalyst was performed on photocatalytic degradation of tetracycline by using batch system in a closed reactor equipped with visible and UV light sources. The result of the photocatalytic degradation was analyzed using UV-Vis spectrophotometer.

The result of the research showed that the $\text{Fe}_3\text{O}_4/\text{ZnO-Ni}$ composite has been successfully synthesized and has magnetic property with a magnetic moment of 23.38 emu/g so it can be separated from the liquid medium using an external magnet. The success of Ni doping was seen in the SR-UV/Vis data from the band gap energy of $\text{Fe}_3\text{O}_4/\text{ZnO-Ni}$ with the dopant concentration of 1, 3, and 5% were 2,92; 2,81; and 2,86 eV, respectively, which indicated that the photocatalysts are responsive to visible light. The photocatalytic activity results showed that the $\text{Fe}_3\text{O}_4/\text{ZnO-Ni}$ 3% photocatalyst material was capable of optimally photocatalytic degradation of tetracycline in 30 ppm tetracycline solution at pH 7 with a photocatalyst mass of 20 mg for 45 min of visible light exposure, with a degradation yield of 99.86%.

Keywords: degradation, $\text{Fe}_3\text{O}_4/\text{ZnO-Ni}$, photocatalyst, tetracycline, visible light.