GREEN SYNTHESIS NANOCOMPOSITE TiO₂/Fe₃O₄ USES A BIOREDUCER OF TURMERIC EXTRACT (*Curcuma longa*) AS A PHOTOCATALYST FOR *METHYL ORANGE* DEGRADATION IN TEXTILE LIQUID WASTE

ABSTRACT

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The textile industry leaves problems related to dye residues (dyes) that can pollute river water. One of the efforts that can be made to overcome this problem is to use photocatalyst materials to degrade the dye. The purpose of this study is to determine the influence of turmeric extract volume (*Curcuma longa*) on the characteristics of TiO_2/Fe_3O_4 nanocomposites, to determine the effectiveness of the synthesized TiO_2/Fe_3O_4 nanocomposites in degrading dyes *methyl orange*, and know the ability *reusable* TiO_2/Fe_3O_4 nanocomposites in degrading *methyl orange*. The research began by synthesizing nanoparticles Fe_3O_4 with green synthesis that utilizes turmeric extract as a bioreducer with three volume variations (10 mL, 20 mL, and 30 mL). The next step is to create a TiO_2/Fe_3O_4 nanocomposite by sonication method. TiO_2/Fe_3O_4 nanocomposites are characterized using *X-ray diffraction* (XRD) to determine its crystal structure, and *Fourier Transform Infrared* (FTIR) to find out the functional cluster. Degradability of TiO_2/Fe_3O_4 nanocomposites to *methyl orange* tested using a Uv-Vis spectrophotometer. The results showed that the nanocomposites had been successfully synthesized TiO_2/Fe_3O_4 based on the crystal structure of the XRD test results and the functional group of the FTIR test results. Based on the results of the degradation test, it was obtained that More and more turmeric extracts are being used as bioreductor, the photodegradation ability is increasing. The most effective TiO_2/Fe_3O_4 nanocomposites are used as photocatalysts in degrading dyes *methyl orange* is a K3 nanocomposite, which is able to degrade MO by 96.99% in the first use (R1) and 85.62% in reuse (R2). Nanocomposites of TiO_2/Fe_3O_4 K3 samples can be used to degrade *methyl orange* as many as 2 uses, with a degradation percentage above 60%.

Keywords: *photocatalyst, green synthesis, methyl orange, nanocomposite, TiO₂*