EFFECTIVENESS ANALYSIS OF DESORPTION AND REGENERATION OF RESIN IMMOBILIZED PHOTOCATALYST (RIP) TiO_2 ON ORGANIC COMPOUNDS REMOVAL IN RIVER WATER TREATMENT

UNDERGRADUATE THESIS

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SURABAYA

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Submitted to Fulfill Part of the Requirements for the Degree of Bachelor of Engineering (S.T) in the Environmental Engineering Program.

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FOREWARD

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Writer

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ABSTRACT

Organic compounds that pollute rivers can degrade water quality and increase the risk of forming harmful byproducts that affect river ecosystems and the surrounding environment. One alternative to improve the efficiency of organic compound removal is photocatalytic technology that combines an anion-exchange resin with a titanium dioxide catalyst (RIP TiO_2). However, the accumulation of organic compounds on the material's surface reduces photocatalytic performance, necessitating a regeneration process to assess the effectiveness of regenerating RIP TiO_2 and the anion exchange resin via desorption with 0.1 N NaOH solution and deionized water. Both materials and their regenerated forms were compared to assess their ability to remove organic compounds in river water treatment. The concentrations of organic compounds after treatment were measured using a UV-Vis spectrophotometer at 254 nm (UV_{254}). At the same time, material characterization was performed using Fourier Transform Infrared (FTIR) spectroscopy and Scanning Electron Microscopy–Energy Dispersive X-ray Spectroscopy (SEM-EDX). The results showed that in the first cycle, NaOH regeneration yielded higher concentrations in the resin and in the RIP TiO_2 materials. Then, over the five photocatalysis cycles conducted, the highest concentration on the TiO_2 RIP was 16.36 mg and on the anion exchange resin was 15.39 mg, indicating that NaOH has a greater ability to desorb the adsorbed organic compounds. However, the high concentration of organic compounds during the desorption process is inversely proportional to the photocatalytic performance, which decreased to 3,21 mg for RIP TiO_2 and 0,93 mg for the anion exchange resin. This study shows that successful regeneration depends not only on the concentration during the desorption process but also on the stability of the materials after repeated use. This means that deionized water can serve as a more sustainable regenerant for water treatment applications.

Keywords: RIP TiO_2, Anion resin, Regenerations, Photocatalysis, Organic Compounds