DEGRADASI RESIDU PESTISIDA KLORPIRIFOS PADA BUNCIS MENGGUNAKAN KATALIS TiO_2/ZEOLIT SECARA FOTOLISIS

SKRIPSI SARJANA KIMIA

Oleh:

RAHMADHANI KHAIRUL BARYAH

NIM: 2110412036

Pembimbing 1: Prof. Dr. Zilfa, MS

Pembimbing 2: Dr. Tio Putra Wendari

PROGRAM SARJANA

DEPARTEMEN KIMIA

FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM

UNIVERSITAS ANDALAS

PADANG

2025

ABSTRACT

PHOTOLYTIC DEGRADATION OF CHLORPYRIFOS PESTICIDE RESIDUES IN GREEN BEANS USING A TIO_2/ZEOLIT CATALYST

by:

Rahmadhani Khairul Baryah (NIM:2110412036)
Prof. Dr. Zilfa, MS*, Dr. Tio Putra Wendari*

***Supervisors**

Pesticide residues such as chlorpyrifos in agricultural products are toxic to both human health and the environment. Titanium dioxide (TiO_2) is a widely used photocatalyst for pollutant removal; however, its efficiency is limited due to its relatively low surface area. To enhance its photocatalytic performance, natural zeolite was employed to improve the effectiveness of TiO_2. Zeolit has a high surface area and strong adsorption capacity, and when combined with a photocatalyst, it can improve pollutant degradation efficiency through simultaneous adsorption and photocatalysis. This study aims to degrade chlorpyrifos pesticide residue on green beans using TiO_2 supported by zeolit through a photolysis process. The TiO_2/zeolit catalyst was synthesized through activation and saturation of zeolit, followed by combination with TiO_2. Chlorpyrifos residues on green bean samples were analyzed using a UV-Vis spectrophotometer, while catalyst characterization was conducted using FTIR and XRD. The study also looked at the effects of photolysis time and catalyst dosage on degradation efficiency. The results showed that the degradation percentage of chlorpyrifos under UV light reached 72.88% with TiO_2 and 30.17% with zeolit. The TiO_2/zeolit composite exhibited a significant improvement in degradation efficiency, reaching 98.82%, indicating an effective synergy between photolysis and adsorption. In the absence of UV irradiation, degradation was only 44.45%, confirming the essential role of UV light in activating TiO_2 as a photocatalyst and enhancing the degradation of chlorpyrifos. The degradation of chlorpyrifos using TiO_2/zeolit followed first-order kinetics, where the reaction rate is directly proportional to the remaining chlorpyrifos concentration. FTIR analysis of the samples indicated successful degradation through the reduction of characteristic peak intensities. Furthermore, FTIR and XRD characterizations of the catalyst showed that the TiO_2/zeolit catalyst maintained its structural stability after the degradation process, allowing for potential reuse. This study shows that TiO_2/zeolit is effective for photocatalytic pesticide removal and may be applied in agricultural waste treatment.

Keywords: *Photolysis, TiO_2/zeolit, chlorpyrifos, degradation, green beans*