## ABSTRACT

*Water pollution caused by dye wastewater from the textile industry remains a significant environmental problem. One type of dye that acts as a pollutant is Remazol Black B (RBB). RBB is an anionic azo dye with a complex aromatic structure, deep blue color, and toxic properties. One effective and environmentally friendly method to overcome this problem is adsorption–photocatalysis. This study aims to synthesize and characterize N-doped ZnO and chitosan/polyvinyl alcohol membranes with ZnO-N as the photocatalyst, as well as to determine their effectiveness in the decolorization process of RBB dye. The study includes the synthesis of ZnO-N using the coprecipitation method and its characterization by FTIR, XRD, and UV-DRS. The synthesis of chitosan and modified chitosan membranes includes chitosan/polyvinyl alcohol (CS/PVA), chitosan/ZnO-N (CS/ZnO-N), and chitosan/polyvinyl alcohol/ZnO-N membranes with ZnO-N weight variations of 0.1 g (CS/PVA/ZnO-N 1), 0.15 g (CS/PVA/ZnO-N 2), and 0.2 g (CS/PVA/ZnO-N 3). The chitosan and modified chitosan membranes were characterized using FTIR, SEM-EDX, and physical tests. Pure chitosan membranes and modified chitosan membranes were then applied in the adsorption–photocatalysis process for the photodegradation of RBB solution. The results showed that the synthesized ZnO-N powder was white with a yield of 67.94%, and the modified chitosan membranes exhibited a transparent yellowish color with slight opacity. The synthesized ZnO-N had a band gap of 3.1542 eV, a hexagonal wurtzite structure, and characteristic ZnO-N absorption bands at wavenumbers of 1518 $cm^{-1}$ and 1329 $cm^{-1}$, which were associated with Zn–N stretching vibrations. The FTIR spectra of the modified membranes showed Zn–O absorption bands around 896–899 $cm^{-1}$ and shifts in the O–H/N–H bands, indicating the successful incorporation of ZnO-N. SEM-EDX results showed that the modified chitosan membranes contained C, O, N, and Zn elements, while pure chitosan did not. The adsorption–photocatalysis process applied to an RBB solution with a concentration of 100 ppm and a volume of 20 mL, conducted for 1 hour without irradiation followed by 5 hours under visible light, showed that the CS/PVA/ZnO-N 2 membrane variation provided the best performance with an RBB degradation percentage of 99.8%.*

***Keywords**: remazol black b, membrane, ZnO-N, adsorption–photocatalysis*