



“Gheorghe Asachi” Technical University of Iasi, Romania



ENHANCED DYE DEGRADATION BY POLYOXOMETALATE-BASED CATALYTIC MEMBRANE

Ali Kemal Topalođlu*, Yilmaz Yildirim

Department of Environmental Engineering, Zonguldak Bulent Ecevit University, Zonguldak, Türkiye

Abstract

Polyoxometalates (POMs) as catalysts considerably affect dye degradation in the aqueous phase. In this study, $H_5PV_2Mo_{10}O_{40}$ (POM), a Keggin-type polyoxometalate, was modified on the surface of microporous polyvinylidene fluoride (PVDF) membrane by a chemical deposition method to fabricate a POM-based catalytic membrane (PVDF+POM). The PVDF+POM membrane was characterized using FT-IR, SEM, and EDX analyses, confirming the successful loading of POM onto the membrane surface. The catalytic performance of PVDF+POM membrane was studied using oxone as an excellent activator for the reactive black 5 (RB5) dye treatment with a cross-flow membrane filtration system. The addition of oxone to the dye solution enhanced the performance of the PVDF+POM membrane, increasing the color removal efficiency from 84.8% to 94.8% and the TOC removal efficiency from 40% to 72%. The results showed that the PVDF+POM membrane in the presence of peroxymonosulfate (oxone) in the RB5 dye solution can achieve high dye removal efficiency.

Key words: catalytic dye degradation, catalytic membrane, oxone, polyoxometalates

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* Author to whom all correspondence should be addressed: e-mail: alikemal.topaloglu@beun.edu.tr, yilmaz.yildirim@beun.edu.tr