Environmental Engineering and Management Journal xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

"Gheorghe Asachi" Technical University of Iasi, Romania

PREPARATION OF POLYACRYLONITRILE ULTRAFILTRATION MEMBRANE WITH ANTI-BIOFOULING AND ANTIBACTERIAL ACTIVITY BY CLICK CHEMISTRY

Jiingqiong Lu[1], Xingpeng Zhang[2], Jing Zhang[1], Hui Wang[1], Jinguo Zhao[1], Yudong Feng[1], Aobo Shen[1], Chengyun Gao[1*]

[1]School of Chemical Engineering and Technology, Taiyuan University of Science and Technology, Taiyuan 030024, China
[2]School of Chemical Engineering, Dalian University of Technology, Dalian 116024, China

Abstract

Ultrafiltration membranes with antibacterial and anti-fouling properties were prepared by click chemistry, through synthesizing tetrazole polyacrylonitrile with acrylonitrile as the raw material by click chemistry, where grafted Sulfonic acid groups were, and chelated silver ions were adopted to fabricate the polymer. Then the properties of these membranes, were characterized by using Fourier-transform infrared spectroscopy, nuclear magnetic resonance hydrogen spectroscopy, X-ray diffraction, scanning electron microscopy, and contact angle analysis, etc. Some notable results were obtained comparing to the PAN membrane, including a decrease of contact angle from 62.17° to 55.14°, reduction of the irreversible fouling index from 67% to 61.9%, and a decrease of the total fouling index was from 30.73% to 16.23% of the PAN-N membrane decreased. Further investigations show its anti-fouling performance was enhanced, with the total fouling index decreasing of 56.1%, and the irreversible fouling index of 8.97%. The chelated silver ion ultrafiltration membranes achieved antibacterial rates of 96.2% against Staphylococcus aureus and 96.1% against Escherichia coli, with inhibition zones of 1.9mm and 2.1mm, respectively.

Key words: antibacterial, anti-biofouling, hydrophilicity, polyacrylonitrile, sulfonic groups

Received: August, 2024; Revised final: June, 2025; Accepted: July, 2025

* Author to whom all correspondence should be addressed: e-mail: 2015020@tyust.edu.cn