INVESTIGATION OF FOULING PARAMETERS IN ULTRAFILTRATION WITH 3D PRINTED TURBULENCE PROMOTER

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Abstract

Dairy factories annually generate an increasing amount of wastewater, which can cause eutrophication due to high concentrations of amino acids and lipids. To address this issue, membrane technology has emerged as a promising solution, but membrane fouling remains a significant challenge, since it can cause decreased flux, decrease membrane rejection performance, and increased energy demand. There may be a solution to the problem the use of three-dimensional printed (3DP) turbulence promoters integrated into membrane modules. These 3DP elements offer innovative opportunities to mitigate fouling by optimizing membrane modules with turbulence promoters.

In this study we designed and fabricated a 3DP turbulence promoter to mitigate membrane fouling in a classic dead-end membrane separation cell. This turbulence promoter was inserted into the ultrafiltration device, which was tested with commercially available polymer membrane to increase local shear stress on the membrane surface. Their ultrafiltration efficiencies were compared to permeate fluxes, different resistances, and fouling index.

Ultrafiltrations were compared with and without turbulence promoters at different pressures (0.1 and 0.2 MPa) and stirring velocities (100, 200, 300 and 400 rpm).

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