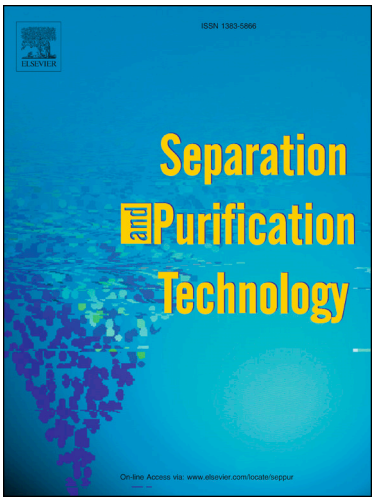

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Membrane development for improved performance of a magnetically induced vibration system for anaerobic sludge filtration

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Keywords: magnetically induced membrane vibration; anaerobic membrane bioreactor; polyvinylidene difluoride; poly ethylene glycol; membrane fouling.

Highlights:

- PVDF membranes were tuned for magnetically induced membrane vibration (MMV)
- Pore size and bulk porosity are most important membrane parameters for use in MMV
- State-of-the-art flux of AnMBR was increased by 60%

Abstract

Magnetically induced membrane vibration as an alternative method to prevent membrane fouling was introduced in the past but membranes were never optimised for these systems. The starting hypothesis of this work is that a more open membrane, which entails a larger flux, can be used to fully benefit from these vibrations. This mechanical movement is expected to drastically reduce the foulant concentration at the membrane surface, thereby giving possibilities for a more open membrane. Polyvinylidene fluoride membranes were thus optimized by adding poly ethylene glycol as a pore-forming agent in different concentrations and with different molecular weight (MW) and by adjusting the polymer concentration in the casting solution. Overall performance of the modified membranes were evaluated using filtration indices (FIs) and a modified critical flux (CF) filtration method. A membrane composed of 12wt% PVDF, 10wt% 1000 Da PEG gave the best performance when the MMV was operated at 15 Hz in AnMBR sludge of 35°C. The state of the art flux for anaerobic membrane bioreactors of 6 L/m^{2}h could thus be improved by more than 60%. Surface