Coalescence of stable oil/water emulsion through microporous polyvinylidene fluoride membranes

ABSTRACT

This work presents the factors that determine the coalescence of the micron-sized oil droplets (<0.4 μm) and the permeation flux by using two different types of commercial flat-sheet microporous polyvinylidene fluoride (PVDF) membranes. Results show that the PVDF-Westran membrane coalesced the oil droplets up to 1.1 μm while the PVDF-Synder membrane enlarged the oil droplets to approximately 5.6 μm. The pore size distribution instead of the both casted and fibrous membrane structures influenced the coalescence of the oil droplets. The membrane feed side that comprised of the smaller pores exhibited better in the coalescence while the pore size on the membrane permeate side did not show the significant effect on the coalescence. The water permeation flux was proportional to the pore size of the membrane feed side while the permeation flux during the coalescence was inversely proportional to the membrane pore size. The oil droplets in the feed solution has reduced the permeation flux about 10 times lower. The addition of the polyacrylamide in the oily water has essentially fouled the membranes at least 1.4 times higher and the foulant has induced the cleavage effect on the oil droplets.