Role of photo-oxidation and adsorption at water back-flushing in hybrid water treatment of multi-channels alumina MF and PP beads coated with photocatalyst

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ABSTRACT

The effect of organic matters on membrane fouling was observed in a hybrid process of seven-channel alumina microfiltration (MF) and polypropylene (PP) beads coated with TiO₂ photocatalyst for advanced water treatment. As a result, the organic matter, like humic acid, could be one of the main factors affecting membrane fouling because the final resistance of membrane fouling decreased significantly due to reduction in humic acid concentration. The treatment efficiencies of turbidity were as high as 96.6–96.9% independent of humic acid concentration, but that of dissolved organic matters was the maximum, 65.4% at humic acid 6 mg/L. Treatment portions of membrane filtration, photocatalyst adsorption, and photo-oxidation were investigated by comparing the treatment efficiencies of (MF), (MF + TiO₂), and (MF + TiO₂ + UV) processes. The membrane fouling resistance was the minimum, and the final permeate flux and the total permeate volume were the maximum at (MF + TiO₂ + UV) process. It means that the photo-oxidation could control membrane fouling, but the photocatalyst adsorption did not participate to reduce membrane fouling in our hybrid water treatment process. The photo-oxidation and the adsorption by PP beads coated with photocatalyst could play a much greater role to remove organic matter than turbid materials.

Keywords: Microfiltration; Photocatalyst; Hybrid process; Ceramic membrane; Water treatment; Photo-oxidation

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