Roles of ultrafiltration, photo-oxidation, and adsorption in hybrid water treatment process of tubular alumina UF and photocatalyst-coated PP beads with air backflushing

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ABSTRACT

The effect of humic acid (HA) concentration on membrane fouling and treatment efficiency was investigated in a hybrid process of tubular alumina ultrafiltration (UF) and TiO₂ photocatalyst-coated polypropylene (PP) beads with air backflushing for advanced water treatment, and compared with the previous study with water backflushing. With increasing HA concentration in water, membrane fouling occurred severely on the surface and inside the ceramic membrane. The treatment efficiencies of turbidity and dissolved organic matters (DOM) were maximal as 99.3 and 89.9% at HA 8 mg/L, respectively. DOM could be treated effectively until higher HA concentration in the hybrid process with air backflushing than that with water backflushing. Treatment portions of UF, photocatalyst adsorption, and photo-oxidation were evaluated by comparing the treatment efficiencies of (UF), (UF + TiO₂), and (UF + TiO₂ + UV) processes. The membrane fouling resistance was minimal at (UF + TiO₂ + UV) process. It proved that the photo-oxidation and adsorption could control membrane fouling in the hybrid water treatment process. The adsorption and photo-oxidation were more excellent to treat DOM in the same hybrid process with water backflushing than that with air backflushing.

Keywords: Ultrafiltration; Air backflushing; Photocatalyst; Hybrid process; Ceramic membrane; Water treatment

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