

Characterization of fouling in immersed polyvinylidene fluoride hollow fibre membrane ultrafiltration by particles and natural organic matter

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ABSTRACT

Turbidity-causing particles and natural organic matter (NOM) in surface water are two major contributors to membrane fouling. This study focused on the effects of particles, NOM and particles-NOM contaminated raw water on membrane fouling in ultrafiltration (UF) and coagulation-UF process, respectively. The kaolinite solution and humic acid (HA) solution was used to simulate the particles and NOM contaminated raw water respectively in the laboratory experiments. It was found that pollutant constituents and concentration of raw water and pre-treatment process had an influence on membrane fouling. There was a linear relationship between the total organic carbon (TOC) concentration of raw water and that of effluent in UF when HA-contaminated raw water was tested. The transmembrane pressure increase rate was in exponential relationship with raw water TOC. HA mainly contributed to the irreversible fouling, while kaolinite mainly brought the reversible fouling. It was verified that coagulation pre-treatment could postpone membrane fouling development in the limited range of coagulant dosage. Additionally, it was also found that combined fouling effects of particles and NOM were not the simple addition of the individual's effect.

Keywords: Ultrafiltration; Membrane fouling; Humic acid; Particles; Coagulation

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