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Membrane fouling properties in a submerged membrane bioreactor for saline wastewater treatment at high ammonium content

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ABSTRACT

In this study, membrane fouling was characterized in a submerged membrane bioreactor employed for the treatment of saline wastewater containing high ammonium content. Three-dimensional excitation–emission matrix (EEM) fluorescence spectroscopy, scanning electron microscopy (SEM), energy-diffusive X-ray (EDX) analyzer, and atomic force microscopy (AFM) were used to analyze the characteristics of the membrane foulants. The results indicated that the gel layer resistance was the major contributor to the total resistance, which eventually led to a severe loss of permeability. The SEM and AFM analyses showed that a slime gel layer was formed on membrane surfaces, which also had a rough surface morphology. The EEM demonstrated that protein-like substances were dominant in the organic substances with fluorescence characteristics in the gel layer. The examination by EDX demonstrated that Na was the major inorganic elements in the gel layer and that the high valence ions such as Si, Al, and Ca were slightly detectable in the foulants.

Keywords: Ammonium removal; Gel layer; Membrane bioreactor (MBR); Membrane fouling; Saline wastewater

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