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A hybrid system combining self-forming dynamic membrane bioreactor with coagulation process for advanced treatment of bleaching effluent from straw pulping process

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ABSTRACT

An innovative hybrid system combining self-forming dynamic membrane bioreactor (SFDMBR) with coagulation process was developed to treat bleaching wastewater from pulping process. Pilot-scale experimental results showed that the average removal efficiencies of chemical oxygen (COD) demand and lignin by the SFDMBR were over 80% and 51%, respectively. The fairly good treatment performances can be attributed partly to the high biomass concentration (i.e. −10 g/L) maintained in the SFDMBR, and partly to the more efficient solid–liquid separation achieved by the self-forming dynamic membranes. It was found that the self-forming dynamic membranes can be quickly created, normally less than 60 min, during the initial stage of SFDMBR operation. Effluent turbidity was lower than 5 NTU in most cases. Membrane fouling can be effectively controlled via 5 min online air backwashing at an intensity of 3.2 $m^3 \cdot m^{-2} \cdot h^{-1}$, and the separation capacity can be restored within 30 min. The effl uent of SFDMBR was subsequently treated by coagulation process with polyaluminum chloride (PAC) to further enhance effluent quality. According to batch test results, the optimal dosage of PAC was determined to be 0.54 g/L. The mean effluent concentrations of COD and lignin were measured to be 117 and 63 mg/L, respectively.

Keywords: Self-forming dynamic membrane bioreactor (SFDMBR); Polyaluminium chloride (PAC); Bleaching effluent; Wastewater treatment

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