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# Organic Rejection and Membrane Fouling with Inorganic Alumina Membrane for Industrial Wastewater Treatment

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**Abstract :** Interests in an inorganic membrane are growing rapidly for industrial wastewater treatment due to its excellent chemical and thermal stability over polymeric membrane. Nevertheless, understanding of the membrane rejection and fouling rate caused by the deposit of contaminants on membrane surface and within membrane pores through inorganic porous membranes still requires much attention. Microfiltration alumina membranes were developed and applied for the industrial wastewater treatment to investigate rejection efficiency of organic contaminant and membrane fouling at various operational conditions. In this study, organic rejection and membrane fouling were investigated by using the alumina flat-tubular membrane developed for the treatment of industrial wastewaters. The flat-tubular alumina membranes were immersed in a fluidized membrane reactor added with granular activated carbon (GAC) particles. Fluidization was driven by recirculating a bulk industrial wastewater along membrane surface through the reactor. In the absence of GAC particles, for hazardous anionic dye contaminants, functional group characterized by the organic contaminant was found as one of the main factors affecting both membrane rejection and fouling rate. More fouling on the membrane surface led to the existence of dipolar characterizations and this was more pronounced at lower solution pH, thereby improving membrane rejection accordingly. Similar result was observed with a real metal-plating wastewater. Strong correlation was found that higher fouling rate resulted in higher organic rejection efficiency. Hydrophilicity exhibited by alumina membrane improved the organic rejection efficiency of the membrane due to the formation of hydrophilic fouling layer deposited on it. In addition, less surface roughness of alumina membrane resulted in less fouling rate. Regardless of the operational conditions applied in this study, fluidizing the GAC particles along the surface of alumina membrane was very effective to enhance organic removal efficiency higher than 95% and provide an excellent tool to reduce membrane fouling. Less than 0.1 bar as suction pressure was maintained with the alumina membrane at 25 L/m²hr of permeate set-point flux during the whole operational periods without performing any backwashing and chemical enhanced cleaning for the membrane.

**Keywords :** alumina membrane, fluidized membrane reactor, industrial wastewater, membrane fouling, rejection
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