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Effect of Fluidized Granular Activated Carbon for the Mitigation of Membrane Fouling in Wastewater Treatment

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Abstract : The use of fluidized Granular Activated Carbon (GAC) as a means of mitigation membrane fouling in membrane bioreactors (MBRs) has received much attention in recent years, especially in anaerobic fluidized bed membrane bioreactors (AFMBRs). It has been affirmed that the unsteady-state tangential shear conferred by GAC fluidization on membrane surface suppressed the extent of membrane fouling with energy consumption much lower than that of bubbling (i.e., air sparging). In a previous work, the hydrodynamics of the fluidized GAC particles were correlated with membrane fouling mitigation effectiveness. Results verified that the momentum transfer from particle to membrane held a key in fouling mitigation. The goal of the current work is to understand the effect of fluidized GAC on membrane critical flux. Membrane critical flux values were measured by a vertical Direct Observation Through the Membrane (DOTM) setup. The polystyrene particles (known as latex particles) with the particle size of 5 μm were used as model foulant thus to give the number of the foulant on the membrane surface. Our results shed light on the positive effect of fluidized GAC enhancing the critical membrane flux by an order-of-magnitude as compared to that of liquid shear alone. Membrane fouling mitigation was benefitted by the increasing of power input.

Keywords : membrane fouling mitigation, liquid-solid fluidization, critical flux, energy input
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