Microscopic mechanism of membrane fouling in micro-filtration

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\textbf{ABSTRACT}

The microscopic mechanism of the membrane fouling was studied using Poiseuille equation, Langmuir adsorption model and Darcy’s law. The experimental result showed that the change in membrane filtration resistance could be divided into three stages in a membrane bioreactor. The first stage was the adsorption and blocking of the membrane pore, and it is completed in a short time ($t \leq 1$ min), so it was suitable to combine its resistance with the intrinsic membrane resistance. The second stage was the change in the concentration polarization during which the resistance increased rapidly. The resistance of the concentration polarization and the resistance of the gel layer were of same character and could be united by the Langmuir relationship. The third stage had stable filtration resistance when the deposition and proliferation of the pollutants on the membrane surface achieved a dynamical equilibrium. A unified model of membrane filtration was proposed for the three stages. The experimental data of the emulsified oil wastewater filtrated by micro-membrane fitted the unified model well.

Keywords: Membrane fouling; Unified filtration model; Membrane bioreactor; Membrane pore blocking; Gel layer formation; Experimental validation

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