

Particle deposition on the patterned membrane surface with the presence of vortex flow

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Membrane separation process requires less energy and chemical usage to separate chemical of interest with high selectivity. As the membrane is subjected to separate mixture, however, permeate flux are readily reduced by the concentration polarization and fouling of the rejected components. Patterned membrane on which micro-sized surface patterns are engraved was introduced to enhance the mass transfer near the membrane surface. Previous studies showed flow characteristics near the patterned membrane surface were thought to be related with the mitigation of membrane fouling. However, particle dynamics and deposition with the presence of the vortex flow is still unclear. In this study, particle deposition on the patterned membrane surface with vortex flow is analyzed by numerical simulation and experiment. A cross-flow particle deposition experiment was conducted and the transmembrane pressure (TMP) and permeate flux are analyzed. Particle trajectories were calculated by solving the Langevin equation. Also, direct simulation was conducted to understand the hydrodynamic interaction near the vortex flow.