

Module Design with Various Baffle Characteristics for Membrane Distillation

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Abstract:

Temperature polarization and concentration polarization have been identified as typical near surface phenomena limiting the performance of membrane distillation. Module design must allow for effective flow reducing the polarization effects near the membrane surfaces and avoiding high hydrostatic pressure drop along and across the membrane surfaces. A potential route to enhancing the membrane distillation performance is geometry modification on the flow channel by employing baffles as vortex generators reducing the polarization effects. In this work, various baffles with different structures were fabricated by 3D printing, and attached to the feed flow channel shell in an air gap membrane distillation module. The effects of the baffle characteristics on the distillation performance were systematically investigated via computational fluid dynamics simulations with various conditions, and verified with related experiments.

Keywords: membrane distillation; module design; baffles; near surface polarization; computational fluid dynamics simulation