Chemical Engineering Thesis Defense

Use of Microbubbles to Mitigate Scaling in Membrane Distillation

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Abstract

Membrane fouling, especially inorganic fouling, is a significant obstacle to treating highly saline brine using membrane distillation (MD). In this study, microbubbles (MBs) were injected into the feed tank of a lab-scale direct contact membrane distillation (DCMD) system, and its effect on permeate flux over time was examined. A synthetic inland reverse osmosis brine with high scaling tendency was used as feed solution. Results showed a sharper flux decline in the absence of MBs compared to when MBs are continuously injected into the feed tank. The introduction of MBs reduced the formation of salt precipitations on the membrane surface, which was the primary cause of the decline in flux. The use of intermittent MBs injection instead of continuous MB injection was evaluated as a way to reduce energy consumption; with a 15 min MBs injection every 2h, similar benefits were found for intermittent injection compared to continuous injection, indicating that providing MBs continuously is not needed to mitigate scale formation. These results show that MBs can be a potential chemical-free method to prevent scaling in desalination systems treating high saline solutions.

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Zoom Link: https://asu.zoom.us/j/3464799831