Taguchi optimization approach for phenolic wastewater treatment by vacuum membrane distillation

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ABSTRACT

In the present research, treatment of phenolic wastewater via vacuum membrane distillation (VMD) was studied. VMD experiments were performed using polytetrafluoroethylene membranes. Taguchi method was applied in order to design the experiments and optimize the experimental results. Effect of different operating parameters, including temperature, vacuum pressure, feed pH and phenol concentration on permeate flux, and separation factor, was studied. The results showed that increasing temperature, decreasing vacuum pressure, decreasing phenol concentration, and decreasing feed pH, enhance permeate flux. Temperature was found to be the most effective factor for permeate flux. Furthermore, it was observed that with decreasing temperature, increasing phenol concentration, and increasing feed pH, separation factor increase. Temperature was found to be the most effective factor for permeate flux. Furthermore, it was observed that with decreasing temperature, increasing phenol concentration, and increasing feed pH, separation factor increase. The experiments showed that water separation factor is approximately independent of vacuum pressure. A temperature of 45˚C, a pressure of 60 mbar, a concentration of 1,000 mg/L, and a pH of 13 were found as the best condition for separation factor determined by the Taguchi method. At this condition, separation factor was found to be 63.63.

Keywords: Wastewater treatment; Membrane distillation; Taguchi method; Phenol

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