



The treatability of landfill leachate by direct contact membrane distillation and factors influencing the efficiency of the process

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ABSTRACT

Landfill leachate is a high-strength wastewater with high concentration of harmful pollutants and is produced in almost all countries with high variation in constituents. In this study, a modified direct contact membrane distillation (DCMD) has been used to investigate the treatability of raw and pretreated landfill leachate. Two different hydrophobic membranes, polytetrafluoroethylene (PTFE) and polyvinylidene difluoride membranes with two different pore sizes (0.22 and 0.45 μm , respectively) were used and performed at three various delta temperatures (ΔT); 30°C, 40°C and 50°C. The rejection efficiencies for conductivity, COD, sulfate, alkalinity and hardness were approximately 85%, 99%, 95%, 90% and 98%, respectively, with raw leachate and 99%, 98%, 92%, 85% and 98%, respectively, with pretreated leachate, while $\text{NH}_4^+\text{-N}$ removal efficiency was about 70% and 92% for raw and pretreated leachate, respectively. The highest transmembrane fluxes (TMF) were obtained at a ΔT of 50°C with 0.45 μm pore size of PTFE membrane. The highest TMF with raw leachate was 9.87 L/m² h while it was 15.54 L/m² h with pretreated leachate. Contact angles and Fourier transform infrared spectroscopy were used to evaluate the resistance of the membranes to wetting and fouling.

Keywords: Landfill leachate; Membrane distillation; Hydrophobic membrane

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