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# Performance of combined PTFE hydrophilic and hydrophobic membrane during laundry/detergent wastewater treatment by air gap membrane distillation (AGMD): an experimental study

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**ABSTRACT**

Membrane distillation (MD) is making a rapid progress in desalination and wastewater treatment research. Though MD produces lower distillate yield compared with other membrane processes, its ability to be used with varieties of renewable and waste energy source coupled to produce ultrapure water makes it a competitive choice. One of the major drawbacks of MD is the fouling and pore wetting of the membrane surface, and therefore modifications to membrane surface characteristics and combining MD with other techniques are necessary for successful rejection of all sorts of organic, inorganic and biological contaminants, except few. One of them is household wastewater containing common laundry detergent sodium dodecylbenzenesulfonate. Although it has been reported that alkaline surfactant causes pore wetting in hydrophobic membranes, but the extent of damage and the severe drop in permeate quality has not been reported. In this work, the preliminary experiments have been carried out with standard laundry wastewater and it has been observed that commercially available hydrophobic polytetrafluroethylene membrane permits all the constituents of the feed water in presence of small amount of laundry detergent. Complete pore wetting of the membrane makes it reach very high permeate flux (40 L/m$^2$ h) and the distillate quality is near to the feed water (>2,400 μS/cm). A simple technique was developed to prevent pore wetting, by combining hydrophilic and hydrophobic membrane without using any interfacial-bonding agent or crosslinking agent. This simple technique successfully produced pure distillate from feed water containing detergent with a conductivity of 12–20 μS/cm.

*Keywords:* Membrane distillation (MD); Air gap membrane distillation (AGMD); Hydrophilic-hydrophobic membrane; Membrane pore wetting; Laundry/detergent wastewater treatment

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