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CHARACTERIZATION OF COMMERCIAL POLYMERIC MEMBRANES FOR MEMBRANE DISTILLATION PROCESSES

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Membrane distillation (MD) is a growing technique for the purification of a wide range of solutions. The main advantages of this technique are the separation effectiveness and the possibility of a consistent energy saving, by an easy coupling with renewable energy sources. Polymeric membranes for use in MD modules must exhibit specific properties, e.g. hydrophobicity, a narrow pore size range, a high water penetration pressure, and a large vapor permeability. The most important performance parameters for a MD membrane are the vapor flux and the liquid entry pressure (LEP). Vapor flux was measured for different commercial membranes, with a self-build dedicated apparatus which avoids the secondary influences of membrane module arrangement on experimental results. The measurements were carried out at different temperatures and using different permeate recovery technique. This latter exert an important influence on the vapor flux. The LEP, i.e. the pressure at which the liquid flows through the membrane pores and contaminates the permeate, was measured with a different apparatus. Results showed a decrease in the early operation cycles, denoting a performance reduction due presumably to microstructural changes in membrane. As a matter of fact, both temperature and pressure can induce modifications in membrane pore size and, in a general view, the membrane morphology. SEM images showed different membrane morphologies, ascribable to different production techniques. An image analysis on SEM micrographs was carried out for a first estimate of pore size distribution, denoting a great difference between the nominal pore size and the effective one.