Critical review of membrane distillation performance criteria

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ABSTRACT

The number of published papers about membrane distillation (MD) has been growing exponentially and many evaluation and performance criteria are used to measure it; but, there is no established tradition or evaluation standard for them. This makes the evaluations difficult to compare, or even incomplete. This paper presents therefore a comprehensive critical review and clarification of the major evaluation criteria for the MD components and systems, aimed to offer some recommendations for their more uniform usage, provide clearer quantitative goals in research and industrial use, and to facilitate more correct and honest representations and comparisons. General description and models of MD are presented first, followed by criteria used to characterize the membranes, and performance criteria to evaluate the distillate production rate, product quality, energy efficiency (including conventional energy performance criteria and exergy performance criteria), transport process, and long-time operation. Since exergy analysis of the process is less known, a detailed example is presented.

Keywords: Membrane distillation; Membrane distillation performance criteria; Water desalination performance criteria; Exergy and energy performance; Transport criteria; Non-equilibrium thermodynamics criteria

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