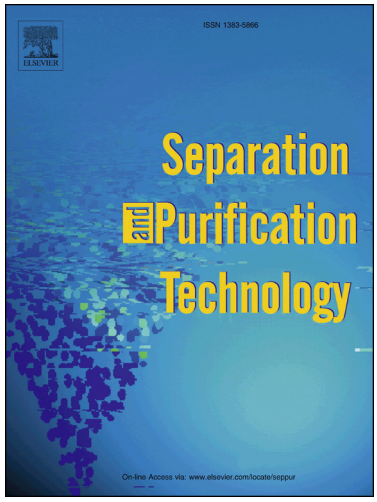

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An heuristic-based selection process for organic solvent nanofiltration membranes

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Abstract
Organic solvent nanofiltration has emerged as a versatile tool for process intensification in chemical production. Due to the complex interactions between membrane, solvent and solute, the transport mechanism has not yet been clarified and it is rather difficult to identify the best membrane for a given separation problem. Currently, this is solved by time-consuming and costly membrane screening experiments. To accelerate process development an heuristic for membrane selection is required. Therefore, the rejections of different substances with varying functional groups out of a material class of specialty chemicals were measured. The most typical membrane materials (Polydimethylsiloxane and Polyimide) and a wide range of solvents were used. From these experiments, parameters were identified which influence the membrane performance. A combination of these parameters in an heuristic allows for the identification of the most suitable membrane for a given separation problem.

Keywords: Heuristic for membrane selection, organic solvent nanofiltration, solvent resistant nanofiltration, polymeric membranes

1 Introduction

Organic solvent nanofiltration (OSN) is a new, highly promising downstream processing method. It is a suitable tool for process intensification because it enables separation without thermal stress and any additives combined with a high potential for energy and resource savings. Successful applications of OSN have already been reported for different industries as pharmaceuticals [1, 2], petro [3, 4] and fine chemicals [5] as well as for different separation tasks as e.g. the recycling of homogeneous catalysts [6-8], solvent recycling [9, 10] and product purification [11]. The economic benefit of this technology was depicted by several examples [12-14]. However, despite all these reported and proven advantages, OSN still is mostly not considered for process development and optimization and industrial applications are relatively rare. The main reason is that the prediction of membrane performance is a hurdle that has not yet been satisfactorily solved.
Several authors investigated the transport behavior and put a lot of effort into the description and prediction of transport phenomena in OSN. Some of them obtained better results for the