

Author's Accepted Manuscript

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PII: S0376-7388(17)30594-X

DOI: <http://dx.doi.org/10.1016/j.memsci.2017.06.069>

Reference: MEMSCI15381

To appear in: *Journal of Membrane Science*

Cite this article as: Carlos Completo, Vítor Geraldês, Viriato Semião, Marília Mateus and Miguel Rodrigues, Centrifugal nanofiltration for small-volume samples, *Journal of Membrane Science* <http://dx.doi.org/10.1016/j.memsci.2017.06.069>

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Centrifugal nanofiltration for small-volume samples

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Abstract

The concentration of small-volume samples containing substances with molecular weight below 1 kDa is usually done by expensive and tedious techniques, and, for this reason it is important to develop expedite and low cost methods. In this work we designed, manufactured and tested an innovative laboratorial centrifugal nanofiltration (CNF) device that accomplishes those targets. The influence of operational parameters on the CNF device performance was comprehensively evaluated, including the effects of: rotational speed, solute type, solute concentration, height h of the filtration chamber and angle β between the centrifugal force and the membrane surface. Using the developed device to nanofilter three model solute solutions (potassium sulfate, sucrose and polyethylene glycol) we were able to obtain concentration factors higher than 20, reducing the sample volume from 3.2 mL to less than 100 μ L of concentrate. Experimental data suggest that the performance obtained is better for negative β angles resulting in the disruption of the concentration polarization layer, whereas h should lie between 0.2 mm and 0.6 mm. The CNF device proved to be a consistent technique to attain the nanofiltration of small-volume samples for further processing or analysis.

Graphical abstract

Keywords

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