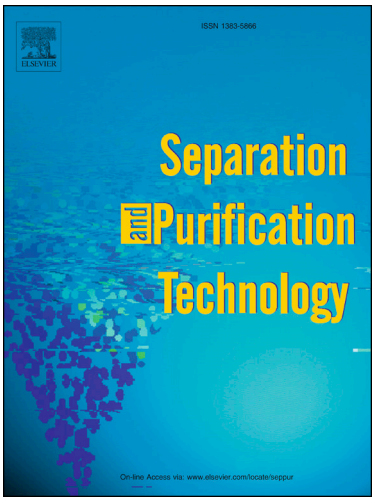

Improvement of MWCO determination by using branched PEGs and MALDI method

Alexey Yushkin, Roman Borisov, Vladimir Volkov, Alexey Volkov

PII: S1383-5866(18)32326-8
DOI: https://doi.org/10.1016/j.seppur.2018.09.043
Reference: SEPPUR 14941

To appear in: *Separation and Purification Technology*

Received Date: 6 July 2018
Revised Date: 14 September 2018
Accepted Date: 15 September 2018

Please cite this article as: A. Yushkin, R. Borisov, V. Volkov, A. Volkov, Improvement of MWCO determination by using branched PEGs and MALDI method, *Separation and Purification Technology* (2018), doi: https://doi.org/10.1016/j.seppur.2018.09.043

Improvement of MWCO determination by using branched PEGs and MALDI method

Alexey Yushkin, Roman Borisov, Vladimir Volkov, Alexey Volkov*

A.V.Topchiev Institute of Petrochemical Synthesis RAS, Moscow, Russian Federation
*Corresponding author. Tel.: +7 (495) 955-48-93; Fax: +7 (495) 633-85-20; E-mail: avolkov@ips.ac.ru.

Abstract

For the first time, matrix-assisted laser desorption/ionization (MALDI) method was successfully applied for identification of the concentration of individual polyethylene glycol (PEG) oligomer used in the complex mixture solutions used for evaluation of separation performance of nanofiltration membranes. As a result, it was possible to plot MWCO curve based on the filtration complex solution contained PEG oligomers with a molecular weight of up to 2000 g/mol. To eliminate the influence of porous support, the dense membranes made of two polymers of intrinsic microporosity, poly(1-trimethylsilyl-1-propyne) (PTMSP) and poly(4-methyl-1-pentene) (PMP), were selected in this study. It was found that the molecular weight cut-off (MWCO) parameter for PTMSP and PMP determined by using of linear PEG were as 1550±30 and 910±30 g/mol, respectively. Such noticeable difference in MWCO was explained by the fact that PMP has about 2 times lower fraction accessible volume comparing with PTMSP (FAV_{PTMSP}=30%, FAV_{PMP}=16%). It was shown that the branched PEGs, trimethylolpropane ethoxylates (TMPE), can overcome the problem of high flexbility of linear PEGs. For example, the corresponded MWCO values for PTMSP and PMP determined with TMPE were 910±30 and 820±30 g/mol, respectively.

Keywords: MWCO, MALDI, PEG, nanofiltration, rejection.

1. Introduction

Today, different membrane processes become as a standard, routine approach to separate various mixtures for the industry and public needs due to a number of advantages including improved energy efficiency, greater flexibility in operation and reduced footprint [1-3]. The effectiveness of any membrane processes strongly depends on the proper selection of the membrane with the certain transport properties that result in the desire separation of different molecules. Particularly, for liquid-based, pressure-driven separation processes such as filtration, the membrane performances can be characterized by terms of the liquid