

Author's Accepted Manuscript

Vacuum-Assisted Tailoring of Pore Structures of Phenolic Resin Derived Carbon Membranes

Siti Nurehan Abd Jalil, David K. Wang, Christelle Yacou, Julius Motuzas, Simon Smart, João C. Diniz da Costa



PII: S0376-7388(16)31702-1
DOI: <http://dx.doi.org/10.1016/j.memsci.2016.11.002>
Reference: MEMSCI14838

To appear in: *Journal of Membrane Science*

Received date: 20 September 2016
Revised date: 1 November 2016
Accepted date: 3 November 2016

Cite this article as: Siti Nurehan Abd Jalil, David K. Wang, Christelle Yacou, Julius Motuzas, Simon Smart and João C. Diniz da Costa, Vacuum-Assisted Tailoring of Pore Structures of Phenolic Resin Derived Carbon Membranes *Journal of Membrane Science*, <http://dx.doi.org/10.1016/j.memsci.2016.11.002>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and a review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain

Vacuum-Assisted Tailoring of Pore Structures of Phenolic Resin Derived Carbon Membranes

Siti Nurehan Abd Jalil^{1,2}, David K. Wang¹, Christelle Yacou^{1,3}, Julius Motuzas¹, Simon Smart¹, João C. Diniz da Costa^{1*}

¹The University of Queensland, FIM²Lab – Functional Interfacial Materials and Membranes Laboratory, School of Chemical Engineering, Brisbane, Qld 4072, Australia.

²Universiti Teknologi MARA (UiTM), Faculty of Chemical Engineering, 40450 Shah Alam, Selangor, Malaysia.

³Université des Antilles, Department of Engineering, BP 250, 97157 Pointe à Pitre Cedex, Guadeloupe, France.

Abstract

This work shows the preparation and separation performance assessment of carbon membranes derived from phenolic resin by a vacuum-assisted method and carbonisation in an inert atmosphere. The vacuum time played an important role in tailoring the structure of the membranes. For instance, pore volumes and surface areas increased from 0.81 and 834 to 2.2 cm³ g⁻¹ and 1910 m² g⁻¹, respectively, as the vacuum time exposure increased from 0 to 1200 s. The significant structural changes correlated very well with water permeation, as fluxes increased by 91% as the vacuum time increased from 0 to 1200s, reaching up to 169 kg m⁻² h⁻¹ at 5 bar. Molecular weight cut-off tests showed no rejection for the smaller glucose and sucrose molecules, though this increased to ~ 80% and full rejection for 36kD and 400kD polyvinyl pyrrolidone. Interestingly, FTIR spectra showed that the peaks of C-H stretching vibration (2800-3200 cm⁻¹) and C-O stretching (1030 cm⁻¹) became more pronounced as a function of increasing vacuum time, strongly suggesting that the use of vacuum further assisted in the polycondensation of phenolic oligomers. Based on these outcomes, a cluster to cluster model is proposed, whereby vacuum application promoted crosslinking reactions of the phenolic resin, creating microporous regions within the clusters, and mesoporous regions between the clusters.

Download English Version:

<https://daneshyari.com/en/article/4989409>

Download Persian Version:

<https://daneshyari.com/article/4989409>

[Daneshyari.com](https://daneshyari.com)