

# Author's Accepted Manuscript

'Up-scaling' Potential for Polyelectrolyte Multilayer Membranes

Nithya Joseph, Pejman Ahmadiannamini, Pulluru Sai Jishna, Alexander Volodin, Ivo. F. J Vankelecom



[www.elsevier.com/locate/memsci](http://www.elsevier.com/locate/memsci)

PII: S0376-7388(15)00472-X  
DOI: <http://dx.doi.org/10.1016/j.memsci.2015.05.042>  
Reference: MEMSCI13724

To appear in: *Journal of Membrane Science*

Received date: 11 February 2015  
Revised date: 21 May 2015  
Accepted date: 23 May 2015

Cite this article as: Nithya Joseph, Pejman Ahmadiannamini, Pulluru Sai Jishna, Alexander Volodin, Ivo. F. J Vankelecom, 'Up-scaling' Potential for Polyelectrolyte Multilayer Membranes, *Journal of Membrane Science*, <http://dx.doi.org/10.1016/j.memsci.2015.05.042>

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 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.

## 'Up-scaling' Potential for Polyelectrolyte Multilayer Membranes

Nithya Joseph<sup>a</sup>, Pejman Ahmadiannamini<sup>b</sup>, Pulluru Sai Jishna<sup>a</sup>, Alexander Volodin<sup>c</sup>, Ivo. F. J Vankelecom<sup>a\*</sup>

<sup>a</sup> Centre for surface chemistry and catalysis, Faculty of Bioscience Engineering, K.U.Leuven, Kasteelpark Arenberg-23, P.O.Box 2461, 3001 Leuven, Belgium. Fax: +3216321998 Tel: +3216321594 E-mail: ivo.vankelecom@biw.kuleuven.be (I.F.J. Vankelecom).

<sup>b</sup> Department of Civil and Environmental Engineering, Michigan State University, East Lansing, MI 48824, USA

<sup>c</sup> Laboratory of Solid-State Physics and Magnetism, Department of Physics and Astronomy, K.U. Leuven, Celestijnenlaan 200D, B-3001 Leuven, Belgium

### Abstract

The layer-by-layer method is an attractive technique for preparing ultrathin nanostructured polyelectrolyte multilayer membranes (PEMMs) with tailored composition and tunable properties. This paper investigates the optimization of the membrane preparation to render it more feasible from a practical view point. PEMMs were prepared with minimal number of bilayers and rinsing steps for two polyion combinations: poly(diallyldimethylammonium chloride) with poly(vinylsulfonic acid sodium salt) and the same cation with poly(sodium 4-styrenesulfonate). Three bilayers proved optimal for SRNF applications. The commonly applied rinsing process turned out to be non-essential. In addition, two minutes dipping time per deposition step already proved sufficient for defect-free SRNF membrane preparation. Thus, the build-up protocol for PEMMs was overall reduced to a 6-step coating procedure taking 12 minutes without compromising the SRNF properties, in contrast to the previously reported 20 to 80 steps which required upto 7 hours. Therefore, the 'up-scaling' potential of this type of membrane is significantly increased and potential production costs reduced.

**Keywords:** Polyelectrolyte. Multilayer. Membrane. Layer-by-layer technique. Solvent resistant nanofiltration

### 1. Introduction

Preparation of thin multilayer films using layer-by-layer technique (LBL) is reported as a versatile method to produce thin nanostructured membranes [1]. The LBL method involves alternate dipping of a charged substrate into oppositely charged polyelectrolytes (PEs) followed by washing after each deposition as schematically shown in Fig1[2]. Each adsorption step then leads to a charge inversion of the substrate, thus forming a layered complex consisting of several bilayers. These layered membranes are formed and stabilized with the help of electrostatic interactions between the charged layers [3]. These self-

Download English Version:

<https://daneshyari.com/en/article/7021219>

Download Persian Version:

<https://daneshyari.com/article/7021219>

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