

Accepted Manuscript

Title: Synthesis of Superhydrophobic Alumina Membrane:
Effects of Sol-gel Coating, Steam Impingement and Water
Treatment

Author: N.A. Ahmad C.P. Leo A.L. Ahmad



PII: S0169-4332(13)01444-X
DOI: <http://dx.doi.org/doi:10.1016/j.apsusc.2013.07.133>
Reference: APSUSC 26107

To appear in: *APSUSC*

Received date: 28-5-2013
Revised date: 18-7-2013
Accepted date: 24-7-2013

Please cite this article as: N.A. Ahmad, C.P. Leo, A.L. Ahmad, Synthesis of Superhydrophobic Alumina Membrane: Effects of Sol-gel Coating, Steam Impingement and Water Treatment, *Applied Surface Science* (2013), <http://dx.doi.org/10.1016/j.apsusc.2013.07.133>

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 proof before it is published in its final 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.

1 **Synthesis of Superhydrophobic Alumina Membrane: Effects of Sol-gel** 2 **Coating, Steam Impingement and Water Treatment**

3 N. A. Ahmad, C. P. Leo*, A. L. Ahmad

4 *School of Chemical Engineering, Engineering Campus, Universiti Sains Malaysia, 14300 Nibong Tebal, Penang,*
5 *Malaysia.*

8 **ABSTRACT**

9 Ceramic membranes possess natural hydrophilicity thus tending to absorb water droplets.
10 The absorption of water molecules on membrane surface reduces their application in filtration,
11 membrane distillation, osmotic evaporation and membrane gas absorption. Fluoroalkylsilane
12 (FAS) grafting allows the conversion of hydrophilic ceramic membranes into superhydrophobic
13 thin layer, but it usually introduces a great increment of mass transfer resistance. In this study,
14 superhydrophobic alumina membranes were synthesized by dip coating alumina support into sol-
15 gel and grafted with the fluoroalkylsilane (FAS) named (heptadecafluoro-1,1,2,2-tetra
16 hydrodecyl) triethoxysilane. Steam impingement and water treatment acted as additional steps to
17 generate surface roughness on sol-gel and most importantly to reduce mass transfer resistance.
18 Superhydrophobic alumina membrane with high water contact angle (158.4 °) and low resistance
19 (139.5±24.9 Gm⁻¹) was successfully formed when the alumina membrane was dip coated into
20 sol-gel for 7 s, treated with steam impingement for 1 min and immersed in hot water at 100 °C.
21 However, the mass transfer resistance was greatly induced to 535.6±23.5 Gm⁻¹ when the dip
22 coating time was increased to 60 s. Long dip coating time contributes more on the blockage of
23 porous structure rather than creates a thin film on the top of membrane surface. Reducing the
24 pore size and porosity significantly due to increase of coating molecules deposited on the
25 membrane. Steam impingement for 1 min promoted the formation of cones and valleys on the

*Corresponding author. Tel.: +60 4 5996425; fax: +60 4 5941013
Email address: chcpleo@eng.usm.my (C.P. Leo)

Download English Version:

<https://daneshyari.com/en/article/5352644>

Download Persian Version:

<https://daneshyari.com/article/5352644>

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