High performance polydimethylsiloxane pervaporation membranes with hyperbranched polysiloxane as cosolinker for separation of $n$-butanol from water

Yunxiang Bai, Jiaqiang Lin, Liangliang Dong, Yuanhua Zhu, Chunfang Zhang*, Jin Gu, Yuping Sun, Youyi Xu

1The Key Laboratory of Food Colloids and Biotechnology, Ministry of Education, School of Chemical and Material Engineering, Jiangnan University, Wuxi 214122, Jiangsu, China

2MOE Key Laboratory of Macromolecule Synthesis and Functionalization, Department of Polymer Science and Engineering, Zhejiang University, Hangzhou 310027, P. R. China

* Corresponding author: E-mail address: zcf326@163.com., Tel: 86-510-85917090; Fax: 86-510-85917763.
1. PV experiments method

The PV experiments were carried out at various temperatures using a pervaporation cell with the effective membrane area of 35.24 cm². In pervaporation operation, the pressure of downstream side (permeate side) was maintained at 200 ± 10Pa. The permeated mass was collected in a condensation trap cooled by liquid nitrogen. The composition in feed mixture and the corresponding permeate was detected by gas chromatography (GC) SP-6800A (Shangdong, China) equipped with a packed column and a thermal conductivity detector (TCD).

![Diagram of experimental equipment]

Fig.S1 Schematic diagram of the experimental equipment

2. Scanning electron microscope

![Surface morphology images]

Fig.S2 Surface morphology of HPSiO-c-PDMS membranes: (a) HPSiO-c-PDMS-1, (b) HPSiO-c-PDMS-2, (c) HPSiO-c-PDMS-3
3. Contact angle measurements of HPSiO-c-PDMS membranes

Fig. S3. Effect of H-PDMS molecular weight on $n$-butanol concentration in membranes and contact angle of HPSiO-c-PDMS membranes

4. GPC spectroscopy of PDMS

Table S1 Molecular weights and PDI of H-PDMS and HPSiO

<table>
<thead>
<tr>
<th>Samples</th>
<th>Molecular weight</th>
<th>PDI$^c$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M_w^a$</td>
<td>$M_n^b$</td>
</tr>
<tr>
<td>H-PDMS-1</td>
<td>39250</td>
<td>24369</td>
</tr>
<tr>
<td>H-PDMS-2</td>
<td>78263</td>
<td>49437</td>
</tr>
<tr>
<td>H-PDMS-3</td>
<td>314043</td>
<td>195815</td>
</tr>
<tr>
<td>HPSiO</td>
<td>3513</td>
<td>1417</td>
</tr>
</tbody>
</table>

$^a$ $M_w$, weight average molecular weight;

$^b$ $M_n$, number average molecular weight;

$^c$ Polydispersity index (PDI) =$M_w/M_n$