# Supplementary Information

# Surface grafting of reverse osmosis membrane with chlorhexidine using biopolymer alginate dialdehyde as a facile green platform for insitu biofouling control

Rashid Khan<sup>a</sup>, Han Wang<sup>a</sup>, Yufang Li<sup>a</sup>, Shuyan Yu<sup>a</sup>, M. Kamran Khan<sup>b</sup>,

Kang Xiao<sup>c,\*</sup>, Xia Huang<sup>a,d,\*</sup>

<sup>a</sup> State Key Joint Laboratory of Environment Simulation and Pollution Control, School of

Environment, Tsinghua University, Beijing 100084, China

<sup>b</sup> Department of Chemical Engineering, Tsinghua University, Beijing 100084, China

<sup>c</sup> College of Resources and Environment, University of Chinese Academy of Sciences,

Beijing 100049, China

<sup>d</sup> Research and Application Center for Membrane Technology, School of Environment,

## Tsinghua University, Beijing 100084, China

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## \*Corresponding authors

E-mail addresses: kxiao@ucas.ac.cn (K. Xiao), xhuang@tsinghua.edu.cn (X. Huang)

#### Section 1S. Details of CLSM image analysis

The CLSM image was captured using 40 x objective lens (C-Apochromat  $40 \times /1.20$  W Korr M27, Carl Zeiss). Then the image was imported into the ImagJ software (National Institutes of Health, USA) and filling image details like pixel height, pixel depth and voxel depth from image information file. After this, the comstat plugins of the ImageJ software were run to analyze thickness distribution and biomass of biofilm. The three-dimensional (3-D) images in the z-stack mode of CLSM were used to determine the average bio-volume  $(\mu m^3/\mu m^2)$  of live and dead cell via the Zen software (Carl Zeiss, Jena, Germany).

#### Section S2. Determination of grafting density

The grafting density (GD, %) of all the grafted membrane was calculated gravimetrically, as described by Liu et al. [1], using the following equation:

$$\operatorname{Gd}(\%) = \frac{w_{\mathrm{t}} - w_{\mathrm{0}}}{A} \tag{1}$$

where A is the surface area of the PA membrane sample  $(m^2)$ ,  $w_0$  and  $w_t$  are the constant weights of membrane sample before and after modification (g), respectively.

[1] Liu, M.; Yu, C.; Dong, Z.; Jiang, P.; Lü, Z.; Yu, S.; Gao, C. Improved separation performance and durability of polyamide reverse osmosis membrane in tertiary treatment of textile effluent through grafting monomethoxy-poly(ethylene glycol) brushes. *Sep. Purif. Technol.* **2019**, 209, 443-451.

Table S1. EDS elemental composition comparison of an memoranes (weight 78)						
Membrane	С	0	Ν	Cl	Total	
Pristine PA	69.13	27.4	2.74	0.27	100.0	
ADA-PA	63.51	32.4	3.4	0.24	100.0	
CH-ADA-PA	53.3	29.68	12.99	4.03	100.0	

 Table S1. EDS elemental composition comparison of all membranes (Weight %)



Figure S1. XPS spectra of of all the membranes (pristine and grafted) after acidic (pH: 1) and basic (pH: 12) cleaning.



**Figure S2.** Photographs of bacterial inhibition of all the membranes. (a) Control with no membrane, (b) Pristine PA, (c) ADA-PA, and (d) CH-ADA-PA.



Figure S3. Grafting density of all the modified membranes.