

Supporting Information Figures

## **Highly Permeable Graphene Oxide/Polyelectrolytes Hybrid Thin Films for Enhanced CO<sub>2</sub>/N<sub>2</sub> Separation Performance**

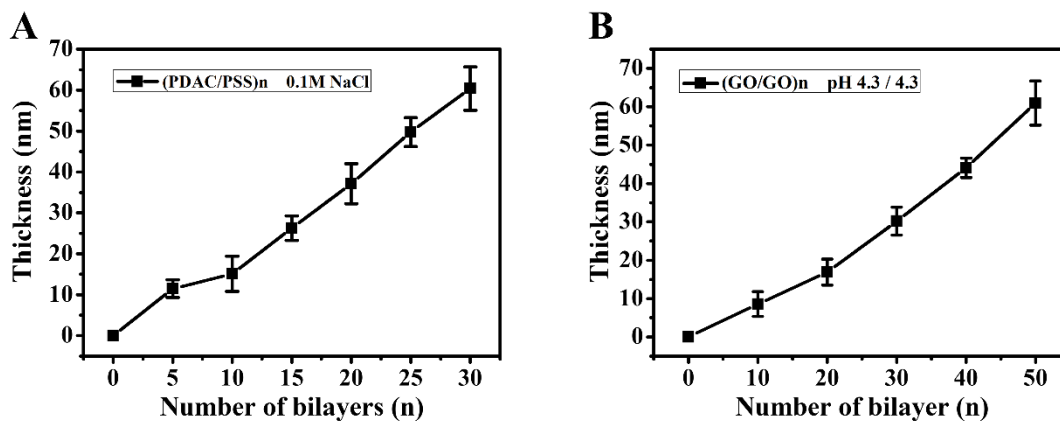
**Jiwoong Heo<sup>1</sup>, Moonhyun Choi<sup>1</sup>, Jungyun Chang<sup>2</sup>, Dahye Ji<sup>2</sup>, Sang Wook Kang<sup>2,\*</sup> and Jinkee Hong<sup>1,\*</sup>**

<sup>1</sup>Department of Chemical Engineering & Material Science, Chung-Ang University, 47 Heukseok-ro, Dongjak-gu, Seoul 156-756, Republic of Korea.

<sup>2</sup>Department of Chemistry, Sangmyung University, Seoul 110-743, Republic of Korea.

\*Corresponding author: E-mail address: [jkhong@cau.ac.kr](mailto:jkhong@cau.ac.kr), Tel.: +82-2-820-5561 ,  
[swkang@smu.ac.kr](mailto:swkang@smu.ac.kr), Tel.: +82-2-781-7601

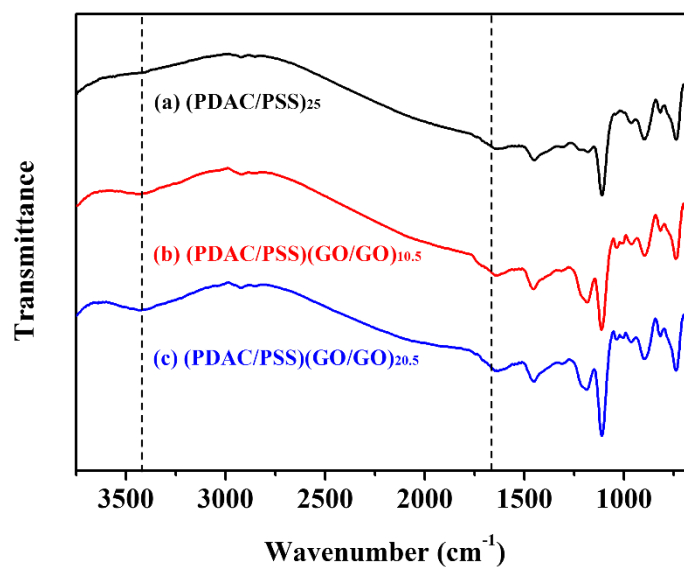
## Supporting Information Figure S1



**Figure S1. Thickness growth profiles of spray-assisted LbL assembled films deposited on a Si wafer. (A) (PDAC/PSS)<sub>n</sub> and (B) (GO/GO)<sub>n</sub> films.**

The thickness growth profiles of the (PDAC/PSS)<sub>n</sub> and (GO/GO)<sub>n</sub> were measured individually. Both multilayer film showed that linear increase in thickness as a function of the number of bilayers. Average increase of (PDAC/PSS)<sub>n</sub> and (GO/GO)<sub>n</sub> film was 1.98 nm per bilayer and 1.22 nm per bilayer respectively. The lesser increase of thickness than those of dipping LbL process is result from kinetic of spray-assisted LbL deposition.

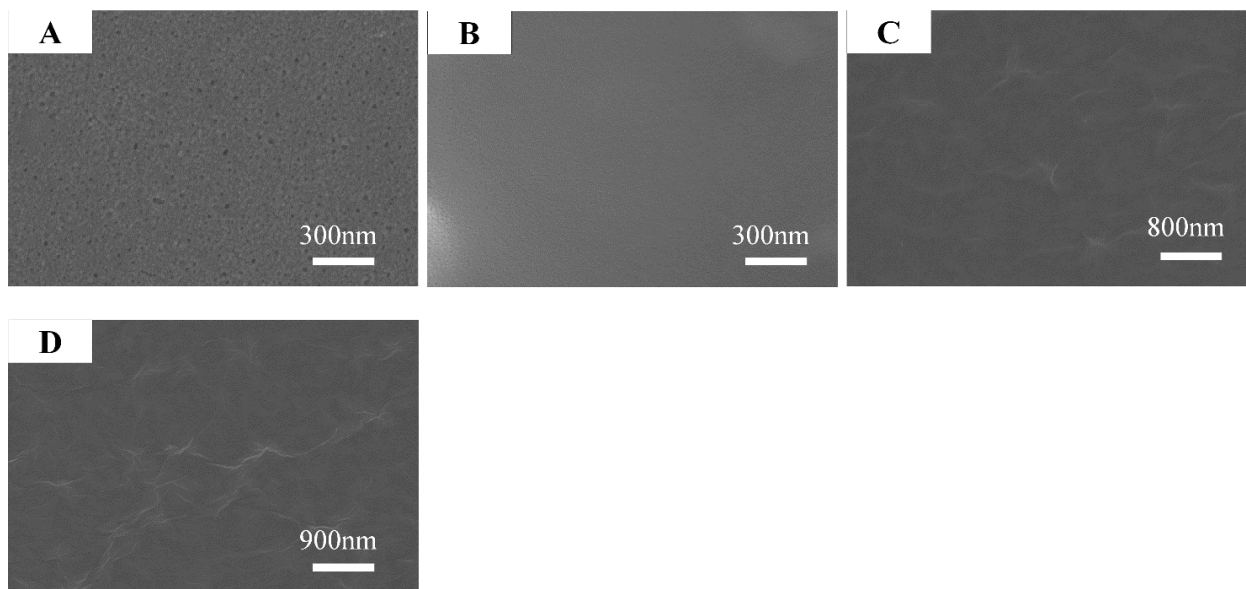
## Supporting Information Figure S2



**Figure S2. FT-IR spectra of (a) (PDAC/PSS)<sub>25</sub>, (b) (PDAC/PSS)<sub>25</sub>(GO/GO)<sub>10.5</sub>, and (c) (PDAC/PSS)<sub>25</sub>(GO/GO)<sub>20.5</sub>.**

We analyzed adsorption of (GO/GO)<sub>n</sub> film on the (PDAC/PSS)<sub>25</sub> base layer by ATR mode of FT-IR. Hydroxyl groups and amine groups on the GO sheets were observed as a broad peak at 3450 and 1620. These peaks were gradually increased as the number of bilayer increased, which represented GO sheets were stacked on the base layer.

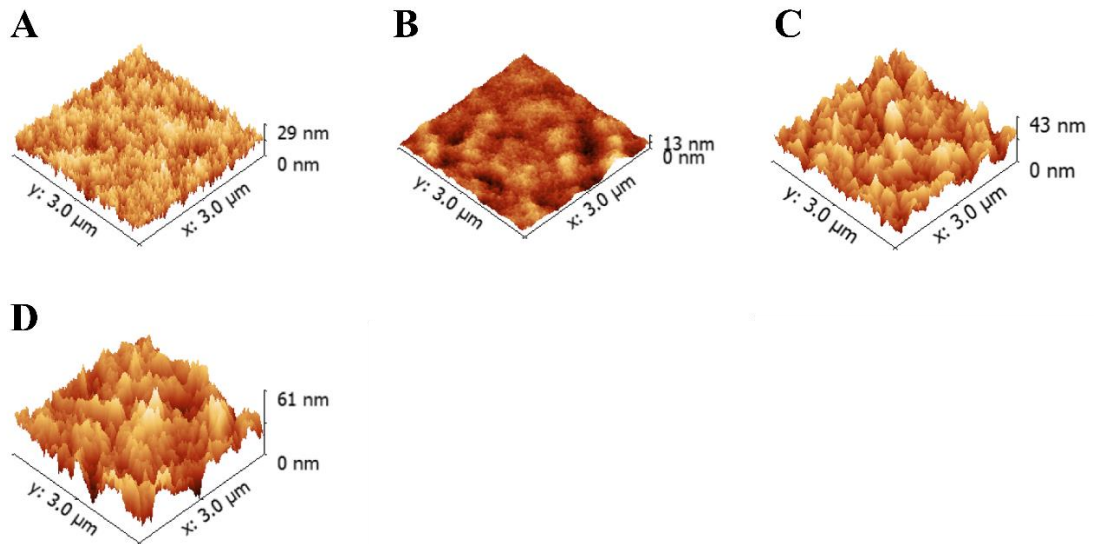
### Supporting Information Figure S3



**Figure S3.** SEM images of LbL multilayer films deposited on membranes. (A) Bare membrane, (B) (PDAC/PSS)<sub>25.5</sub>, (C) (PDAC/PSS)<sub>25</sub>(GO/GO)<sub>10.5</sub>, and (D) (PDAC/PSS)<sub>25</sub>(GO/GO)<sub>20.5</sub>.

The surface morphologies of membranes were measured by top-view SEM. Pores of bare PSf membrane were covered by (PDAC/PSS)<sub>25.5</sub> film, which has a flatter surface compare to other surfaces. As the number of GO layer increases, the ratio of wrinkled GO structure also increased, which result in rough surface.

## Supporting Information Figure S4



**Figure S4. 3D view of AFM images of LbL multilayer films deposited on membranes.**

**(A) Bare membrane, (B) (PDAC/PSS)<sub>25.5</sub>, (C) (PDAC/PSS)<sub>25</sub>(GO/GO)<sub>10.5</sub>, and (D) (PDAC/PSS)<sub>25</sub>(GO/GO)<sub>20.5</sub>.**

The surface roughness of membranes was investigated by 3D view of AFM. Comparatively rough surface of PSf membrane was flattened by (PDAC/PSS)<sub>25.5</sub> film. Surface roughness gradually increased as the number of (GO/GO)<sub>n</sub> layer increased, which result from wrinkle structure of GO sheets.