

Description of Additional Supplementary Files

File Name: Supplementary Data 1

Description: Current, i.e. I (mA), variation with fixed DC voltages of $V_{WE} - V_{CE}$ in the GO electrophoresis deposition. The $V_{WE} - V_{CE}$ was fixed on 1.5, 1.8, 2.1, 2.4, 2.7, 3.0, 3.3, 3.6, 3.9, 4.2, 4.5, 4.8 and 5.1 V, respectively.

File Name: Supplementary Data 2

Description: Cyclic voltammetry (CV) results (5th, 15th, 25th and 35th cycle) of GO sample on the glass-carbon electrode at room temperature.

File Name: Supplementary Data 3

Description: Time dependence of voltages $V_{WE} - V_{CE}$ and V_{CE} in the three-electrode system for GO deposition with a V_{WE} of 3.2 V

File Name: Supplementary Data 4

Description: X-ray diffraction (XRD) results of pristine GO and ED-GO (2 θ =5-30 °)

File Name: Supplementary Data 5

Description: Atomic force microscopy (AFM) height profiles of the pristine GO and ED-GO bilayers

File Name: Supplementary Data 6

Description: Fourier transform infrared (FTIR) spectroscopy results of pristine GO and ED-GO samples

File Name: Supplementary Data 7

Description: X-ray photoelectron spectroscopy (XPS) C1s results and the deconvoluted results of pristine GO and ED-GO.

File Name: Supplementary Data 8

Description: Raman spectroscopy results of pristine GO and ED-GO samples.

File Name: Supplementary Data 9

Description: Permeances of the small gases and light hydrocarbons through ED-GO@PSSHf membrane in single gas measurement ($P=2$ bar and room temperature)

File Name: Supplementary Data 10

Description: Separation performance (i.e. permeance and separation factor) of ED-GO@PSSHf membrane for binary gas mixtures (the volume ratio of mixture is 1:1, $P=2$ bar and room temperature).

File Name: Supplementary Data 11

Description: Separation performance (i.e. flux and separation factor) of ED-GO@PSSHf membrane for binary alcohol-water mixture by pervaporation at 70 °C (the

weight ratio of mixture is 1:1)

File Name: Supplementary Data 12

Description: Comparison of ED-GO@PSSHf membrane performance (i.e. flux and separation factor) for the separation of methanol-water mixture with the reported polymeric membranes, zeolite membranes, silica membranes and GO based membranes.

File Name: Supplementary Data 13

Description: Desalination performance (i.e. ion rejection and flux) of ED-GO@PSSHf membrane for different saline solutions by the vacuum membrane distillation at 60 °C.