Supporting Information for

Polymer Brushes Functionalized Janus Graphene Oxide/Chitosan Hybrid Membranes

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Materials: Styrene (St, AR) was purchased from Alfa Aesar. N, N-dimethylaminoethyl methacrylate (DMAEMA, AR) was purchased from Energy Chemical. Chitosan (AR), acetic acid (AR) and toluene (AR) were purchased from Sinopharm Chemical Reagent. Graphene oxide sheets were prepared following a modified Hummer method. St and DMAEMA were purified over Al_2O_3 column and then stored at low temperature prior to use. Other reagents were used as received without further purification.

Preparation of GO nanosheets: GO was prepared following a modified Hummers' method[1]. In a typical procedure, $NaNO_3$ (0.95 g) and graphite (1.0 g) were added into 46 mL concentrated H_2SO_4 (98%) under stirring. After 10 min, 6.0 g $KMnO_4$ was added slowly. The mixture was then heated to 35°C and stirred for 6 hours. Subsequently, 80 mL water was added dropwise under vigorous stirring, resulting in a quick rise of the temperature to ~80°C. The mixture was further stirred at this temperature for 30 min. Afterwards 200 mL water and 6 mL H_2O_2 solution were added in sequence to dissolve the insoluble manganese species. The resulting graphite oxide suspension was washed repeatedly by a large amount of water until the pH of the solution reached a constant value at ~4.0, and finally the suspension was diluted to 600 mL with water. 200 mL of the diluted graphite oxide suspension was transferred into a 500 mL conical beaker, and the suspension was gently shaken in a mechanical shaker at a

speed of 160 rpm for ~6 hours. To remove the small amount of unexfoliated particles, the resulting viscous suspension was centrifuged at 2,000 rpm for 10 min, producing a brown, homogeneous colloidal suspension of GO sheets. The colloidal suspension could be further concentrated by centrifugation at 8,000 rpm.

Fabrication of GO/chitosan membrane: GO/chitosan membrane was prepared by modification of previous report[2]. GO suspension (1 mg/mL in 9:1 DMF/water mixture) was gently applied using a plastic pipette onto the surface of chitosan solution with various concentrations in a glass Petri dish. The GO gradually spreads and forms a thin film at the air-liquid interface, which can subsequently be collected as a free-standing sheet by being transferred to a silicon substrate and dried under ambient conditions.

Fabrication of Janus membrane: Polymerization was conducted by immersing silica supported GO/chitosan film in ~2 mL freshly distilled and degassed bulk monomer and irradiated with an UV lamp with a spectral distribution between 200 and 400 nm (λ_{max} = 365 nm). The distance between the reactor and the UV lamp was kept to be 10 cm, and irridiation intensity is about 200mW/cm^2.Polymerization and grafting reactions were performed with styrene for 2 hours. The one surface modified filmwas then rigorously rinsed by toluene using Soxhlet extraction apparatus for 24 h.Rinsed film was subsequently floated on the surface of 0.1 g/mL KOH solution and the film was released from substrate 30 min later. The released film was turned over and deposited on silica wafer. The subsequent photografting followed the steps of PS grafting in which styrene was replaced by N,N-dimethylaminoethyl methacrylate (DMAEMA).

Characterization: Atom force microscopy (AFM) images were performed on a CSPM 5500 scanning probe microscope system in the tapping mode. Scanning electronic microscopy (SEM) measurements were performed on a Hitachi S4800 field-emission SEMsystem. Fourier transform infrared (FTIR) spectra were recorded on an Agilent Carry 600 spectrometer. Contact angles were measured by a Data physics OCA20 contact anglemeter. X-ray photoelectron spectroscopy (XPS) measurements were conducted on a

ShimadzuAXISULTRA DLD system.

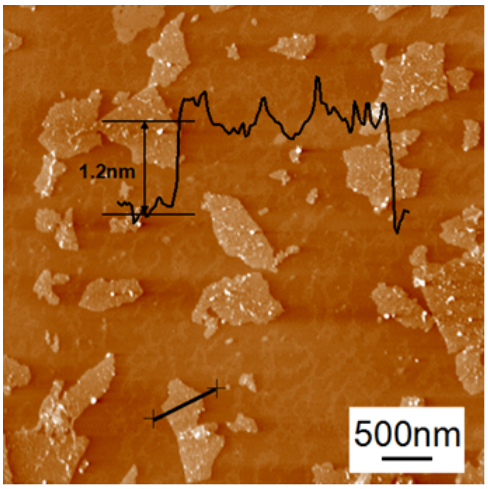

Fig.S1AFM image of GO nanosheets and section curve of a single layer GO sheet.

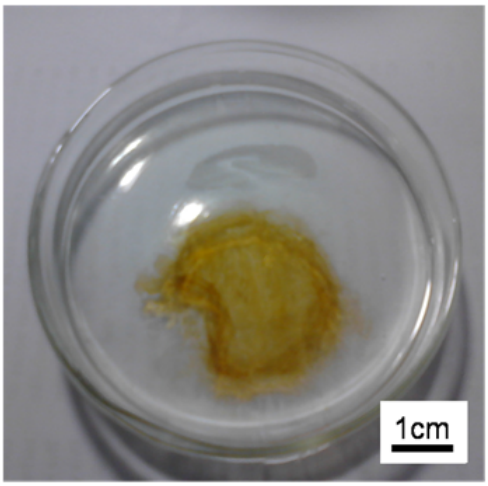

Fig. S2 Photograph of a GO/chitosan composite membrane.

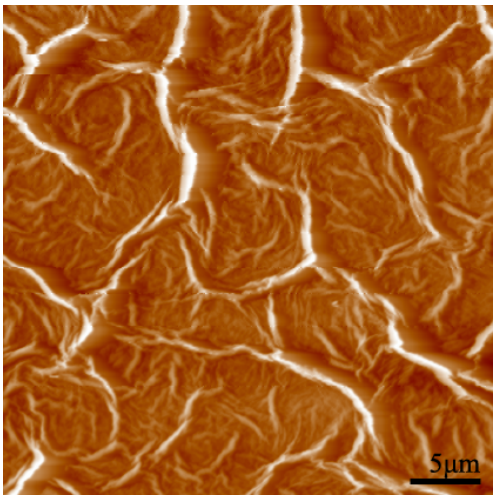

Fig.S3 AFM image of the upper surface of GO/chitosan membrane.

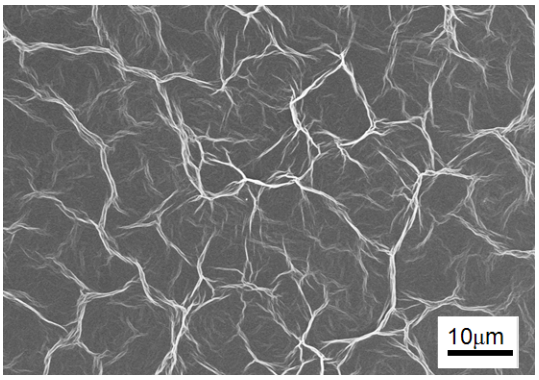

Fig.S4 SEM image ofthe upper surface of GO/chitosan membrane.

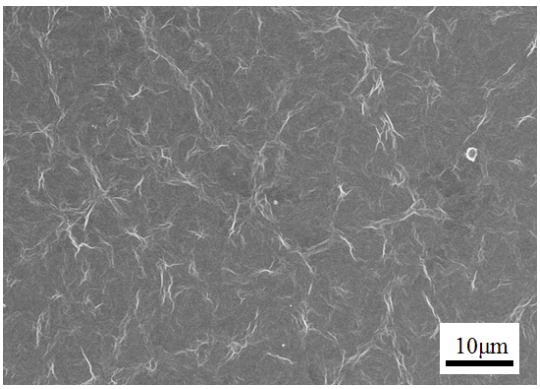

Fig.S5 SEM image of the lower surface of GO/chitosan membrane.

Reference

[1] X. Zhou, and Z. Liu, *Chem.Commun*, 2010,**46**,2611-2613.

[2] J.Zou, and F. Kim, *ACS nano*, 2012,**6**,10606-10613.