

Supporting Information for

SWCNT-Intercalated GO Ultrathin Films for Ultrafast Separation of Molecules

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1. Thickness and lateral size of the as-prepared GO nanosheet

Thickness and lateral size of the as-prepared GO nanosheets which were used to fabricate the SWCNT-intercalated GO ultrathin films was measured by AFM measurement as shown in Fig. S1. The average thickness of the GO nanosheets is 1.015 nm, which indicates the GO nanosheets are single-layered. The lateral size of the GO nanosheets is 300 nm-800 nm.

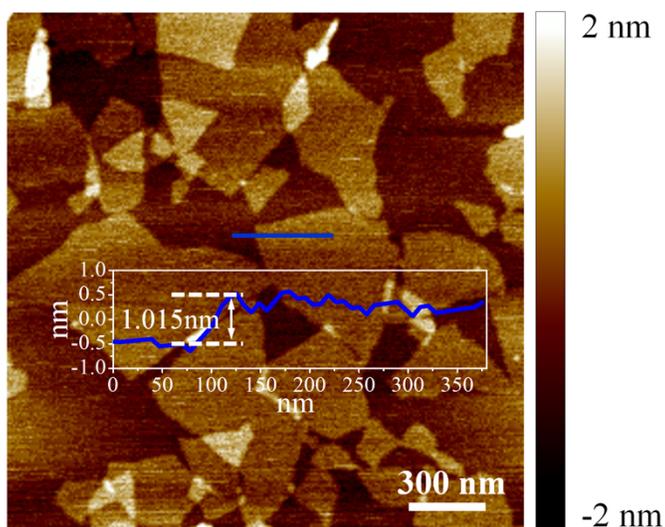


Fig. S1 AFM image and height profile of the as-prepared GO nanosheets.

2. Bundle diameter of the SWCNTs used in this work

SWCNTs used to fabricate the SWCNT-intercalated GO ultrathin films are shown in Fig. S2.

Most of the SWCNTs aggregate to form bundles with diameter of 5-20 nm.

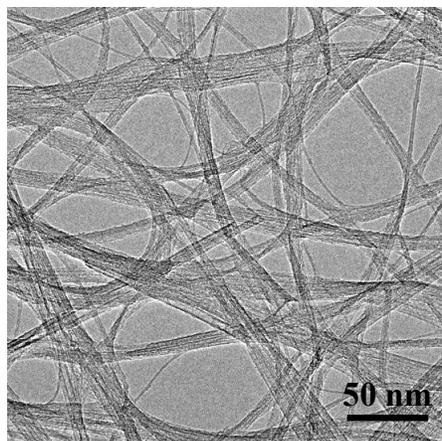


Fig. S2 (a) TEM image of the SWCNTs used in this work.

3. Flexibility of the SWCNT-intercalated GO ultrathin film

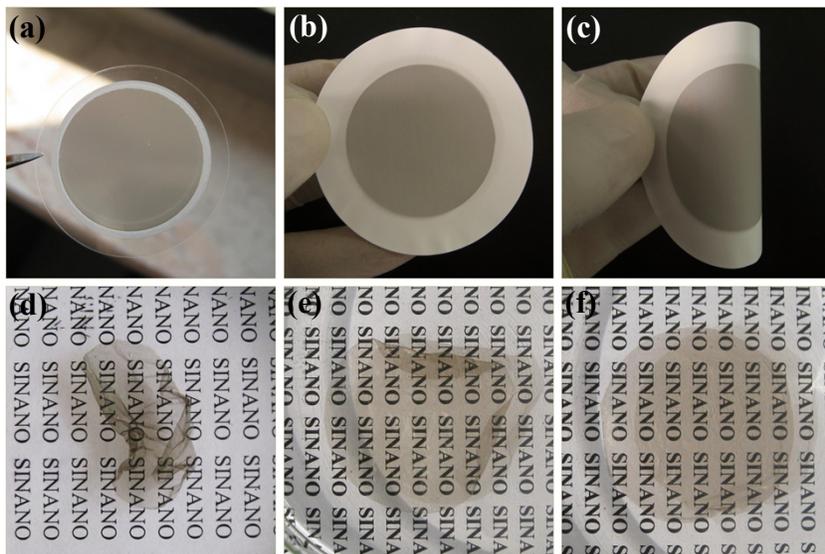


Fig. S3 (a) Digital photo of a SWCNT-intercalated GO ultrathin film fabricated on an AAO membrane. (b, c) Digital photos of a SWCNT-intercalated GO film fabricated on a MCE membrane and be bend to an angle of 180°. (d-f) Digital photos of a SWCNT-intercalated GO film in a water/acetone solution. When a droplet of acetone is placed onto the surface of the curled film, the film spreads out again. During the whole process, not any damage happened on the film, indicating the SWCNT-intercalated GO film is very flexible and robust enough.

4. UV-vis absorption spectra of molecule solutions before and after separated by a 40-nm-thick SWCNT-intercalated GO film

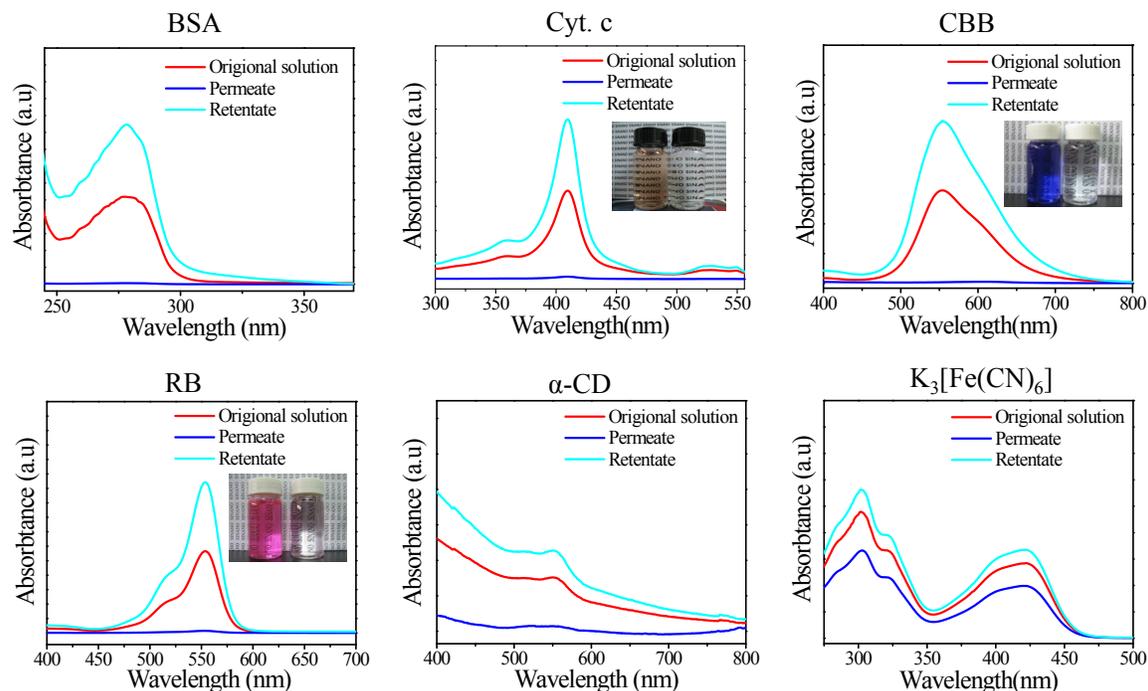


Fig. S4 UV-vis absorption spectra of the feeds, permeates and retentates of six different molecule solutions before and after separation by a 40-nm-thick SWCNT-intercalated GO film. The inserts are optical images of the feeds and the permeates.

5. Table S1 Rejection rates of BSA, Cyt. C, CBB and RB calculated based on the concentrations and volumes of retentates and original feed solutions*

Molecule	MW (g mol ⁻¹)	Size (nm)	Concentration	Analyte charge	Rejection (%)
BSA	66430	5 × 5	5 g L ⁻¹	-	95 ± 1
Cyt. c	12800	2.5 × 3.7	125 mg L ⁻¹	-	95 ± 1
CBB	854	2.7 × 1.8	15 mg L ⁻¹	-	94 ± 1
RB	479	1.8 × 1.4	15 mg L ⁻¹	+	92 ± 1

*The rejection rate is calculated based on the concentration and volume of retentate and original feed solution according to the equation: $R = (C_R \times V_R) / (C_O \times V_O) \times 100\%$, where C_R is the molecule concentration in retentate, C_O is the molecule concentration in original feed solution, V

is their corresponding volume). UV-vis absorption spectrum is used to determine the concentrations as shown in Fig. S4.