membranes

In Situ Incorporation of TiO_2@Graphene Oxide (GO) Nanosheets in Polyacrylonitrile (PAN)-Based Membranes Matrix for Ultrafast Protein Separation

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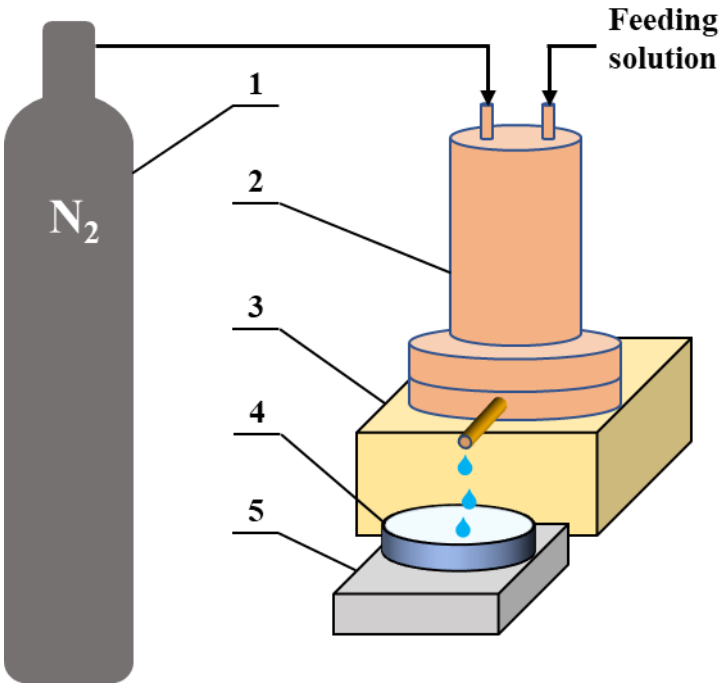


Figure S1. Schematic diagram of the homemade dead-end filtration equipment in filtration and anti-fouling tests. 1. Nitrogen cylinder, 2. Filtration cell, 3. Magnetic Stirrer, 4. Dish, 5. Balance.

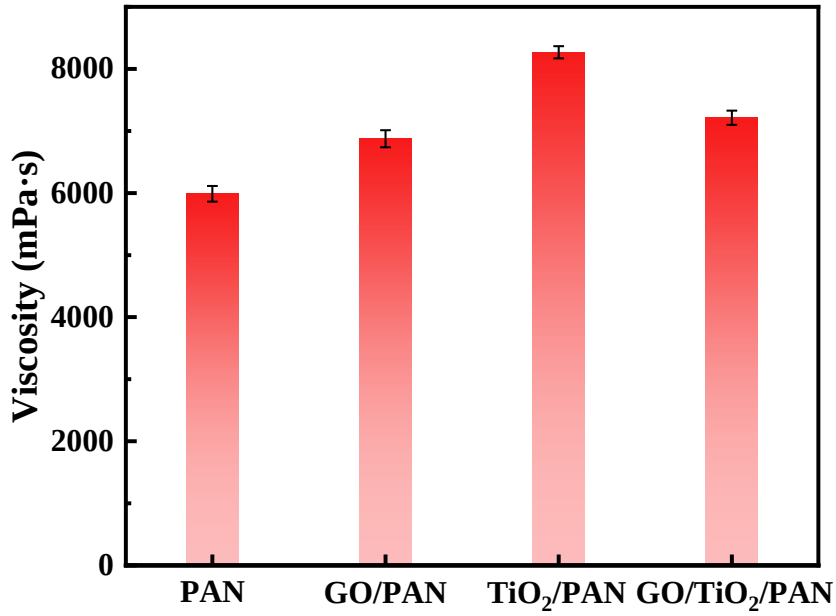


Figure S2. Casting solutions' viscosity of the PAN, GO/PAN, TiO_2/PAN and GO/TiO_2/PAN membranes.

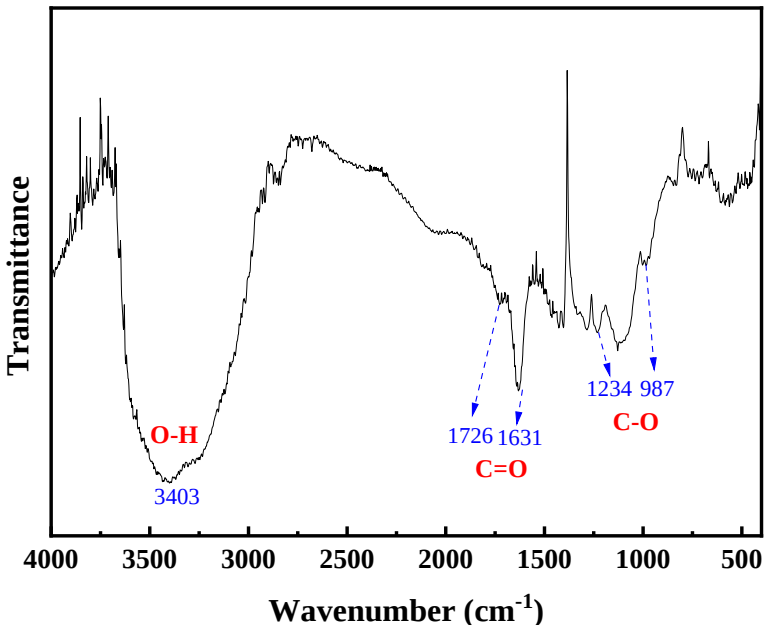


Figure S3. FTIR of the prepared GO nanosheets.

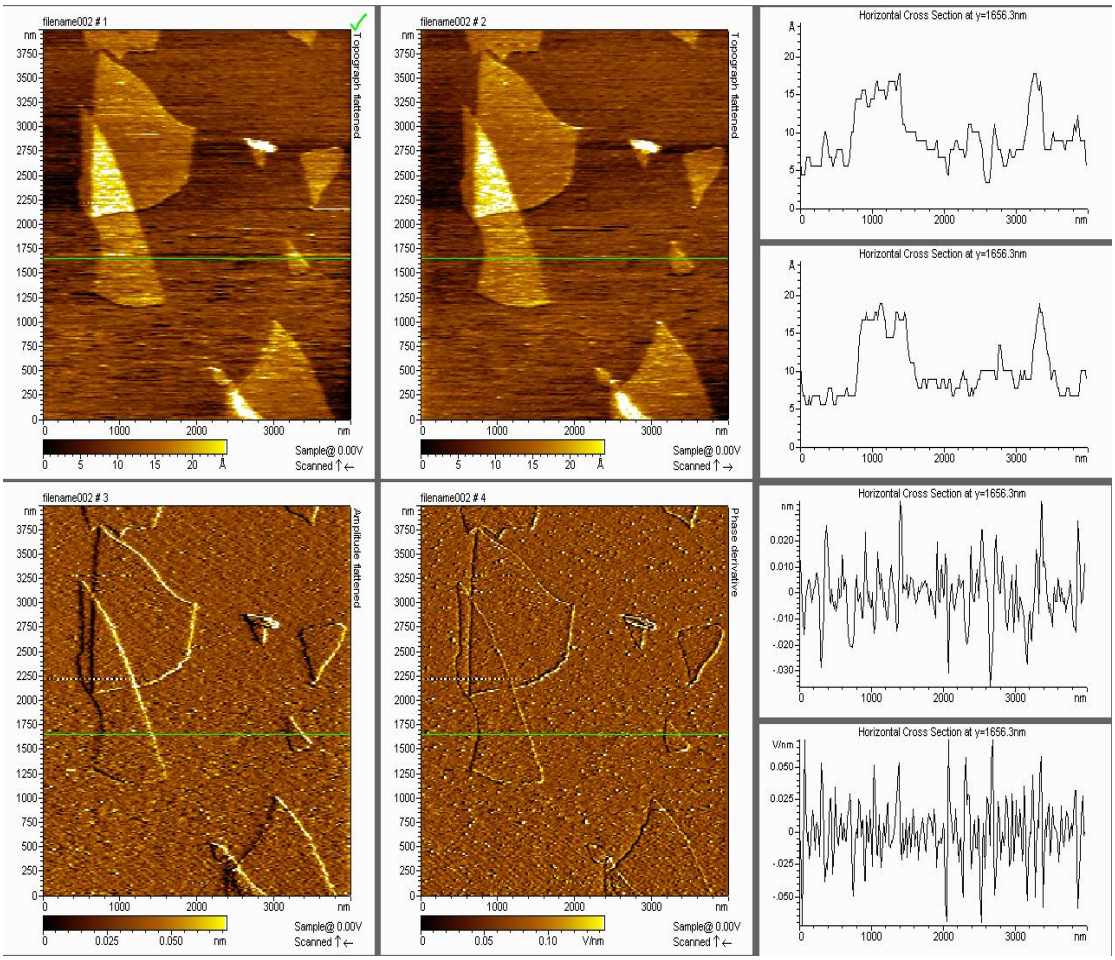
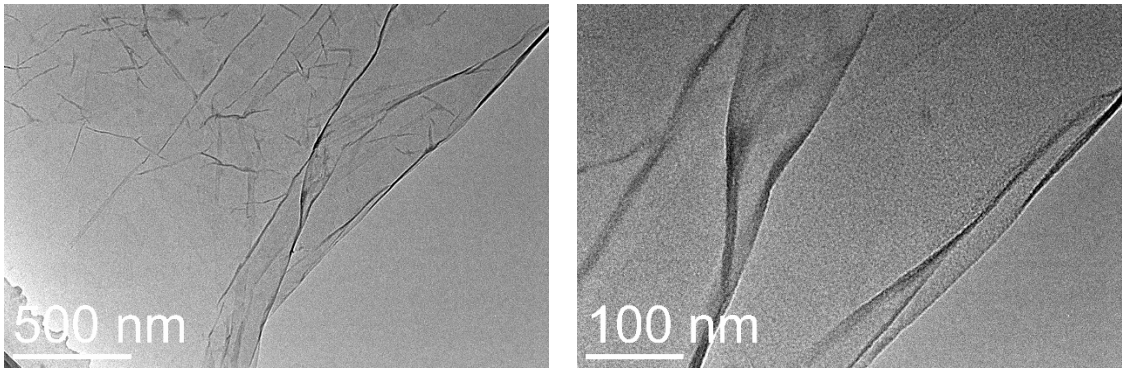


Figure S4. AFM images and curves of the horizontal cross sections of the prepared GO nanosheets.



(**a**) (**b**)

Figure S5. (a) and (b) TEM images of the prepared GO nanosheets.

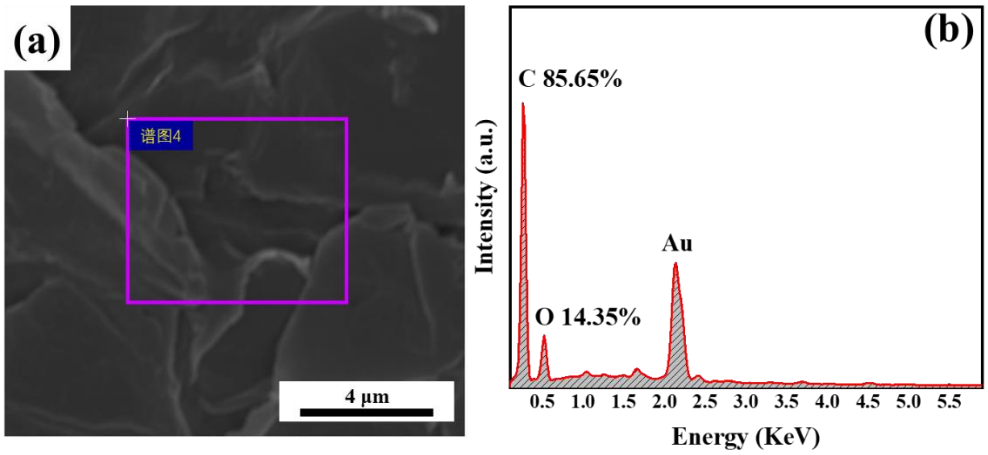


Figure S6. (**a**) FESEM images of the original GO nanosheets prepared by the modified Hummer's method. (**b**) corresponding EDX spectrum of the GO nanosheet's surface.

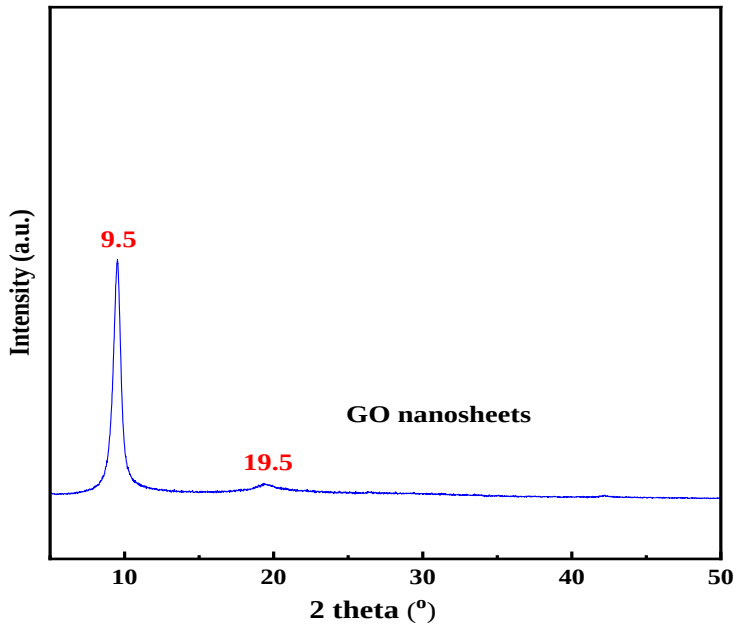


Figure S7. XRD curve of the prepared GO nanosheets.

Table S1. Comparison of the UF performance with others.

Membrane	Symbol	Pressure (MPa)	BSA Concentration ($g \cdot L^{-1}$)	Water Flux ($L \cdot m^{-2} \cdot h^{-1}$)	BSA rejection (%)	Ref.
DPPA-GO/PSF		0.1	0.2	245.1	95.8	[1]
QSiPD-rGO/PES		0.1	0.5	270.0	98.0	[2]
2% GO-7/PSF		0.3	1.0	1056.6	88.7	[3]
K90/GO/PVDF		0.2	0.5	1388.6	89.0	[4]
APTS-GO/PVP/PES		0.4	1.0	248.0	99.5	[5]
PES/0.3GO/5T904		0.1	1.0	245.0	93.3	[6]
Q-PSF/GO(0.5)		0.2	0.5	686.2	98.0	[7]
1-TiO_2/PVDF		0.1	0.5	322.4	87.2	[8]
25(SPPSu)/TiO_2		0.2	0.1	60.0	93.0	[9]
PVDF/TiO_2		0.1	1.0	156.2	35.2	[10]
PVDF/rGO/TiO_2(70/30)		0.3	0.5	219.5	99.3	[11]
0.15wt% rGO/TiO_2/PES		0.5	0.5	50.5	98.5	[12]
0.5%TNT/PVDF		0.1	0.2	160.5	64.2	[13]
GO/TiO_2/PAN		0.1	1.0	1487.6	99.5	This work

Table S2. Anti-fouling parameters of the PAN, GO/PAN, TiO_2/PAN and GO/TiO_2/PAN membranes in cyclic anti-fouling tests.

Membranes	First Cycle				Second Cycle			
	FRR (%)	R_i (%)	R_{ir} (%)	R_t (%)	FRR (%)	R_i (%)	R_{ir} (%)	R_t (%)
PAN	51.62	38.42	48.38	86.80	71.37	52.42	28.63	81.05
GO/PAN	59.67	41.75	43.61	85.36	78.23	53.42	25.38	78.80
TiO_2/PAN	62.89	45.04	37.11	82.15	81.68	57.86	18.30	76.16
GO/TiO_2/PAN	68.43	47.89	31.57	79.46	87.74	58.21	12.26	70.47

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