Supplementary Information

Bioinspired photo-responsive membrane enhanced with the "light-cleaning" feature for controlled molecule release

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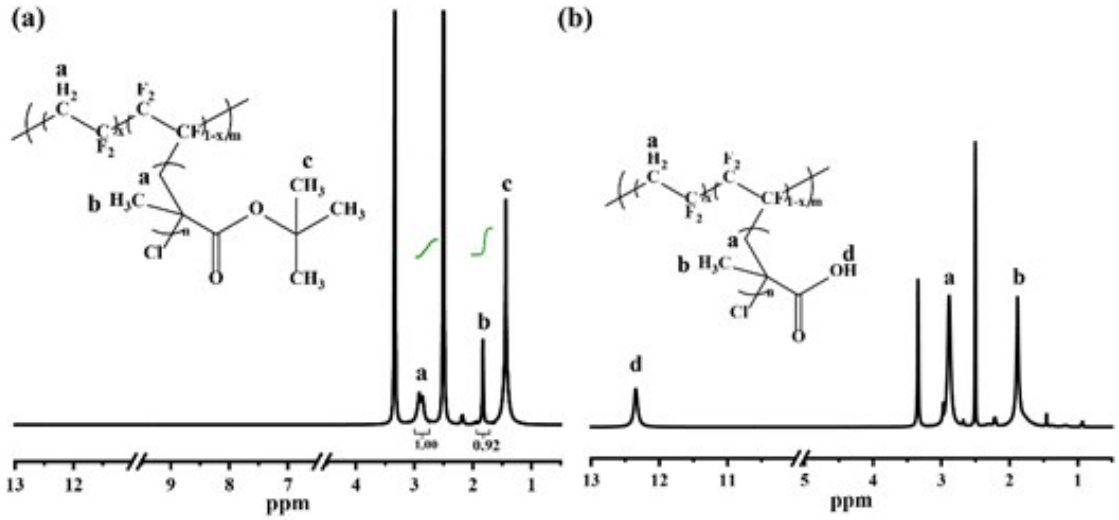

Figure S1. ^{1}H NMR spectra of (a) P (VDF-CTFE)-PtBMA and (b) P (VDF-CTFE)-PMAA.

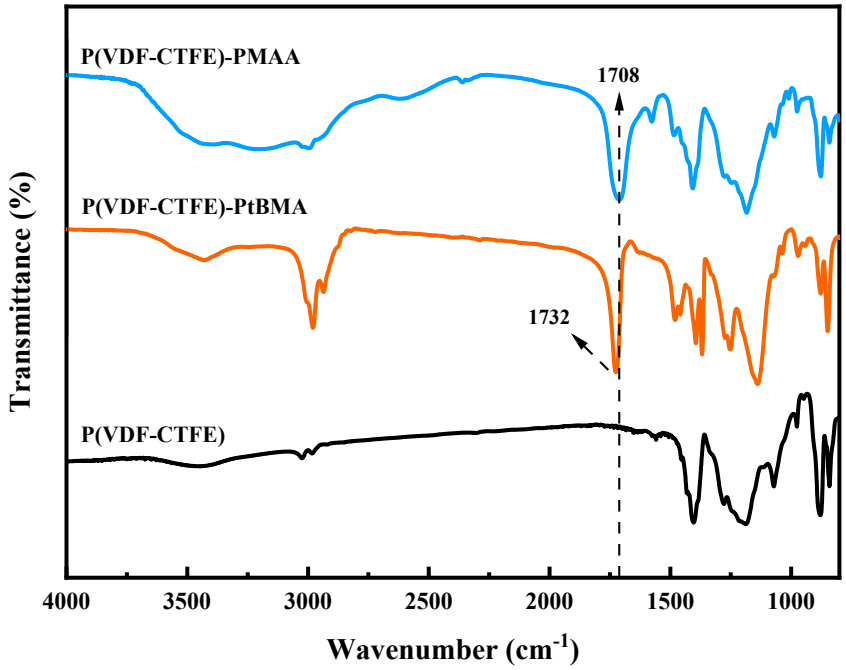

Figure S2. FTIR spectra of P (VDF-CTFE), P (VDF-CTFE)-PtBMA and P (VDF-CTFE)-PMAA.

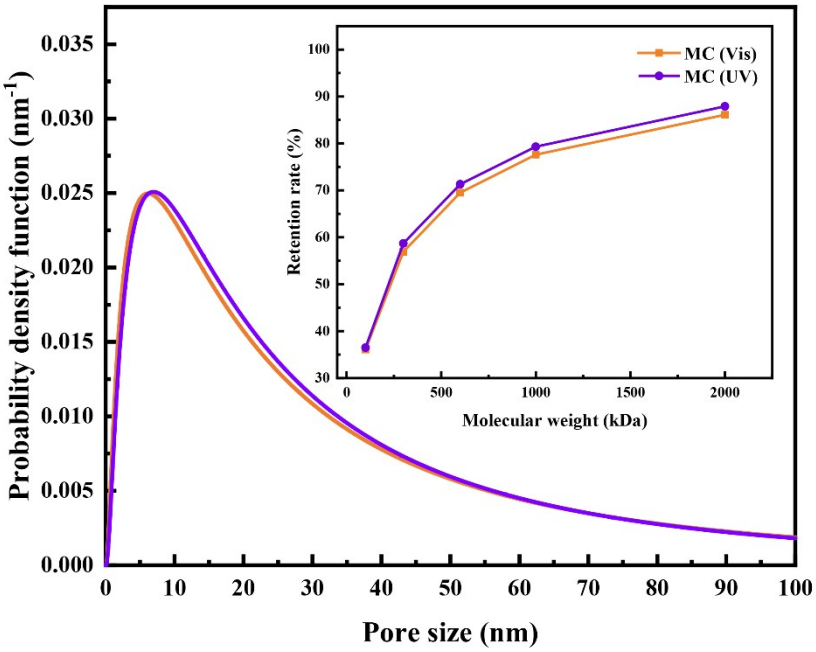

Figure S3. Pore size distribution of MC at Vis and UV determined by retention of PEG/PEOs with different molecular weights.

Table S1. Average pore diameters and standard deviations of PRMs

Membrane	Vis		UV		Variation ratio
	Average pore diameter (nm)	Standard deviation (nm)	Average pore diameter (nm)	Standard deviation (nm)	
MC	27.6	3.4	26.9	3.2	-3%
M1	11.9	2.1	15.1	2.1	27%
M2	9.0	1.9	12.8	2.2	42%
M3	6.6	2.1	12.3	1.9	86%

Table S2. Water flux of MC, M1, M2 and M3 in Vis and UV

	Irradiation	MC	M1	M2	M3
Flux (L m^{-2}h^{-1})	Vis	105.0±1.6	164.3±3.3	113.8±2.4	64.7±2.5
	UV	104.4±3.1	206.4±4.8	172.3±5.4	140.1±3.0

Table S3 Z-average sizes of micelles prepared by L1, L2, and L3 at Vis and UV

Polymer		Z-average (d. nm)
L1	Vis	294.5±5.5
L2		333.7±2.9
L3		355.3±3.9
L1	UV	358.4±4.0
L2		404.6±5.6
L3		511.8±4.2

Table S4. Water contact angle of MC, M1, M2 and M3 at Vis and UV

Membrane		MC	M1	M2	M3
Contact Angle (°)	Vis	42.6±1.6	27.2±1.4	31.7±2.5	38.9±2.3
	UV	42.3±1.2	24.6±1.8	26.5±2.2	31.4±2.1

Table S5. Relative flux decay (RFD), relative flux recovery (RFR) and relatively flux recovery after "light-cleaning" (RFRL) of LRMs in BSA solution filtration experiments.

Membrane	J_0 (LMH)	J_P (LMH)	J_W (LMH)	J_L (LMH)	RFD (%)	RFR (%)	RFRL (%)	Retention (%)
MC	105.3	50.0	69.1	69.2	52.5	65.7	66.5	42
M1	162.7	102.3	125.1	143.3	37.1	76.9	88.1	74
M2	112.4	66.1	81.7	104.1	41.0	72.7	92.6	79
M3	63.3	34.7	43.9	57.2	45.2	69.4	90.3	81

Note: J_0: initial pure water flux, J_P: final flux of pollutant filtration, J_W: recovered pure water flux after backflushing, J_L: recovered pure water flux after light-cleaning enhanced backflushing

Table S6. Relative flux decay (RFD), relative flux recovery (RFR) and relatively flux recovery after "light-cleaning" (RFRL) of LRMs in *E. coli* solution filtration experiments.

Membrane	J_0 (LMH)	J_P (LMH)	J_W (LMH)	J_L (LMH)	RFD (%)	RFR (%)	RFRL (%)	Retention (%)
MC	106.8	43.7	65.6	68.9	59.1	61.4	64.5	99
M1	165.3	92.6	115.4	120.1	44.0	69.8	87.2	99
M2	117.9	61.0	81.1	107.6	48.3	68.8	91.3	99
M3	65.7	30.2	43.4	59.7	54.1	66.1	90.8	99

Table S7. Relative flux decay (RFD), relative flux recovery (RFR) and relatively flux recovery after "light-cleaning" (RFRL) of M2 in two cycle of BSA and *E. coli* solution filtration experiments.

Membrane	J_0 (LMH)	J_P (LMH)	J_L (LMH)	RFD (%)	RFRL (%)	Retention (%)
1^{st} BSA	112.4	66.1	104.1	41.0	92.6	79
2^{nd} BSA		60.8	101.7	45.9	90.5	80
1^{st} *E. coli*	117.9	61.0	107.6	48.3	91.3	99
2^{nd} *E. coli*		59.5	108.2	50.5	91.8	99

Note: 1^{st} : the first cycle, 2^{nd} : the second cycle.

Table S8. Concentration of PVP and PEO3 in permeate at Vis or UV after different filtration cycles by M3.

Cycle No.	1	2	3	4	5		Total amount (mg)
PVP at Vis (mg/L)	41.4	27.9	22.5	7.6	0.3		0.997
Cycle No.	6	7	8	9	10	11	Total amount (mg)
PEO3 at UV (mg/L)	35.3	24.8	19.5	13.6	5.2	0	0.984

Note: 9.5 mL of the DI water was added to the filtration cell after every filtration cycle.