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Title	Preparation of high performance nanofiltration (NF) membranes incorporated with aquaporin Z(Figures)
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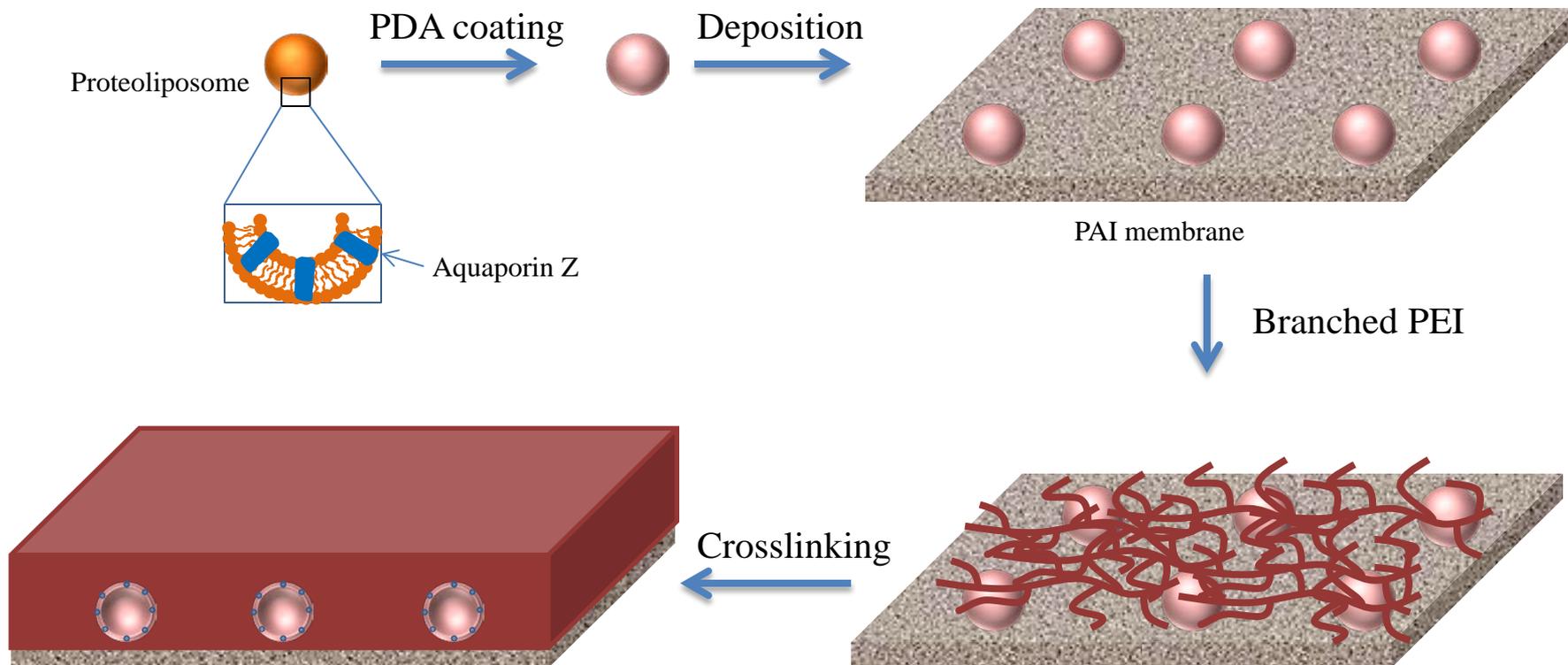


Figure 1. Schematic diagram of AQP based biomimetic membrane preparation. (not to scale)

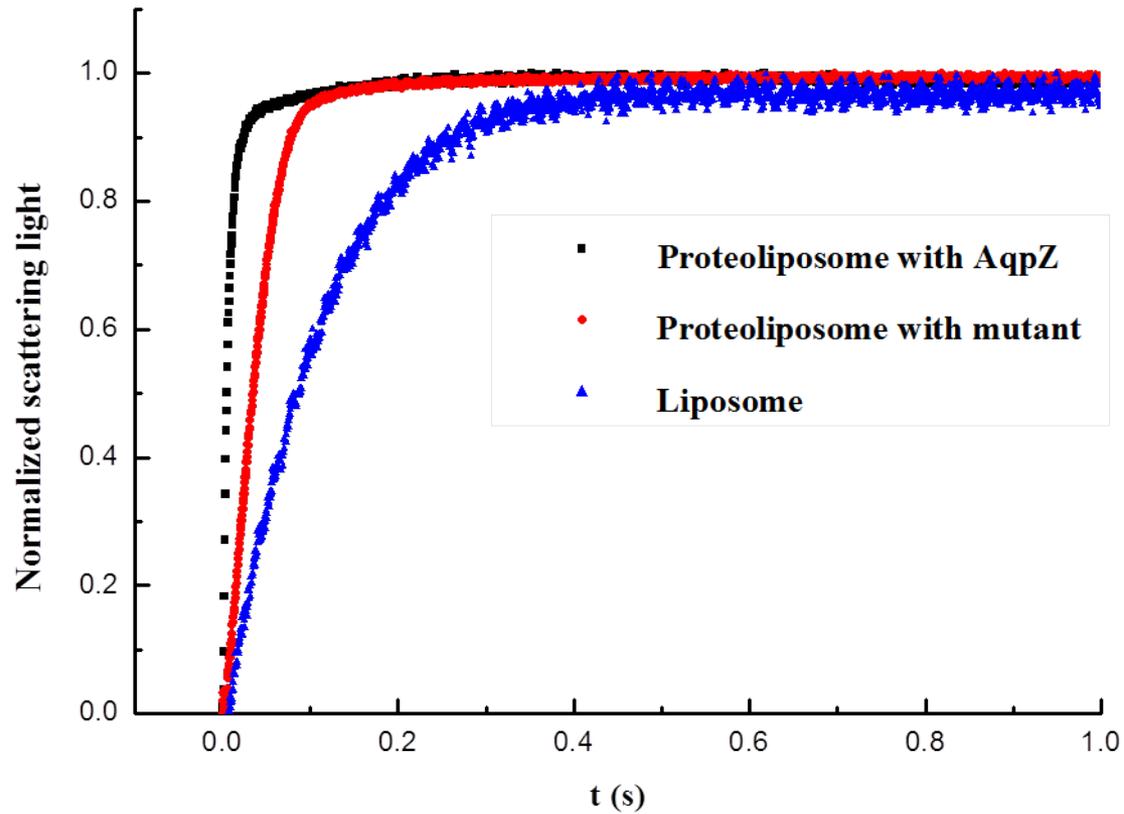


Figure 2. Normalized stopped flow curves of liposomes, proteoliposomes with AqpZ and mutant.

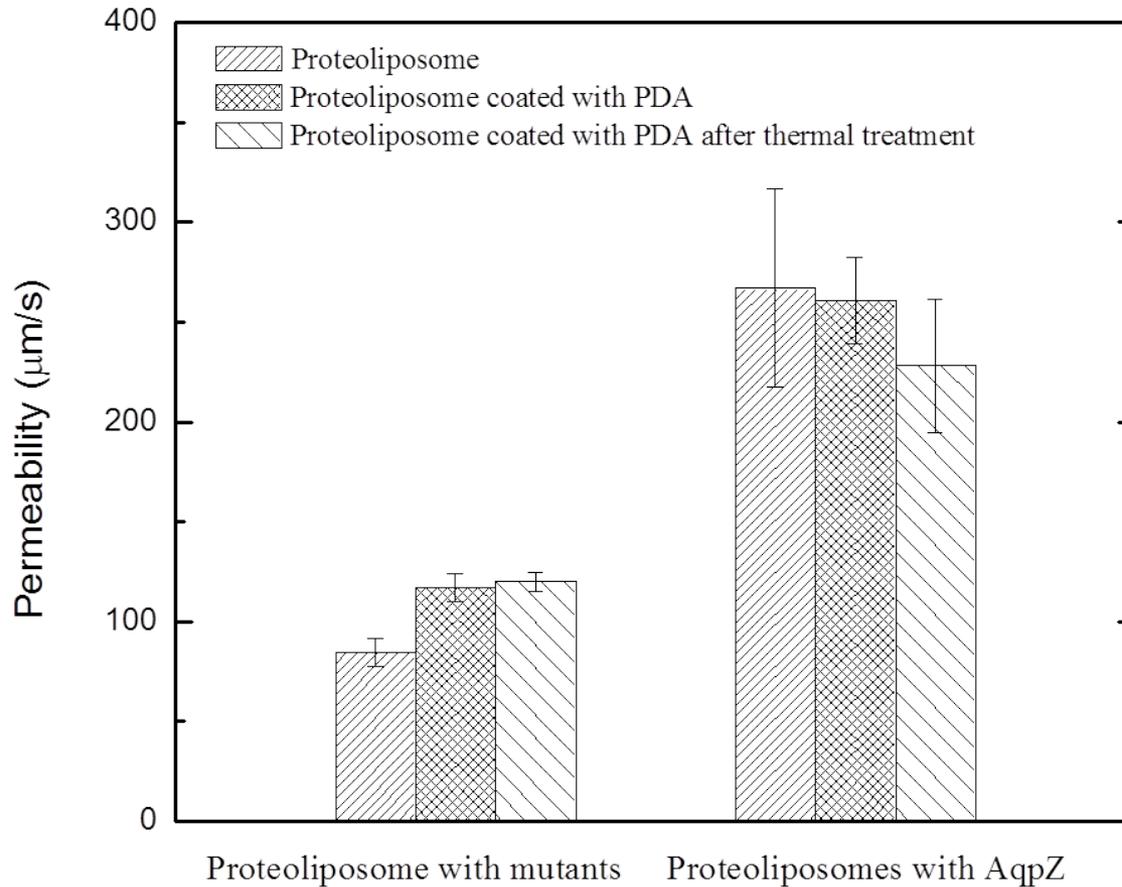


Figure 3. Water permeability of proteoliposomes with mutants (left group) and AqpZ (right group) after different treatments: non-coated, PDA coating, PDA coating and thermal treatment (70 °C, 2h).

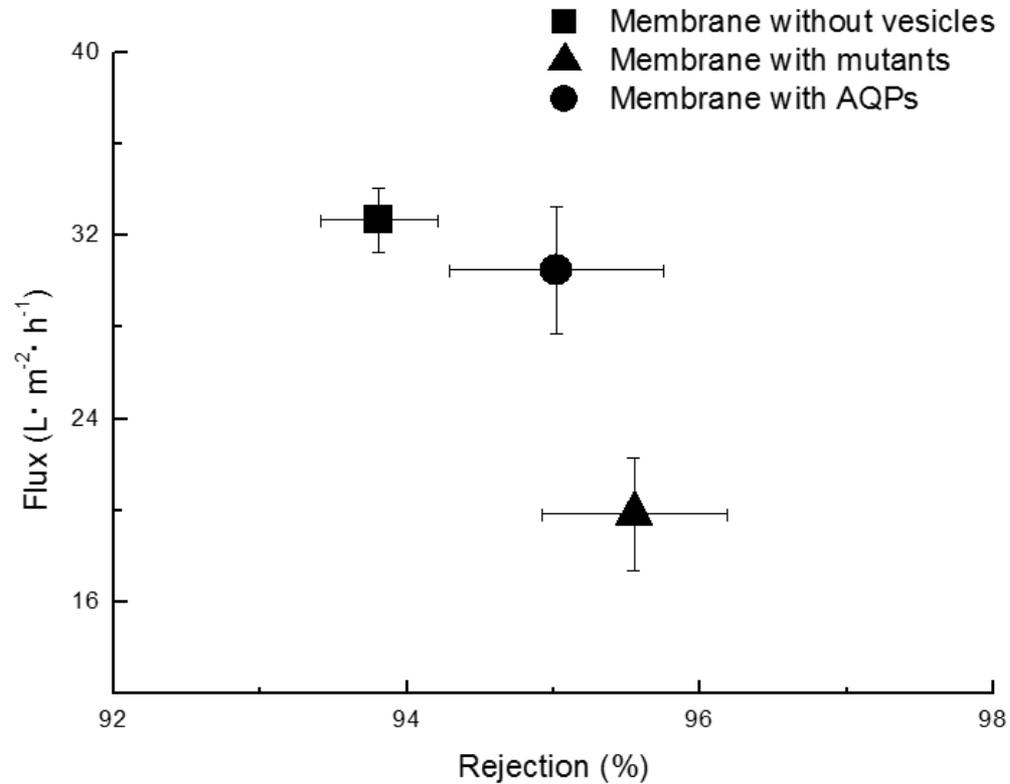
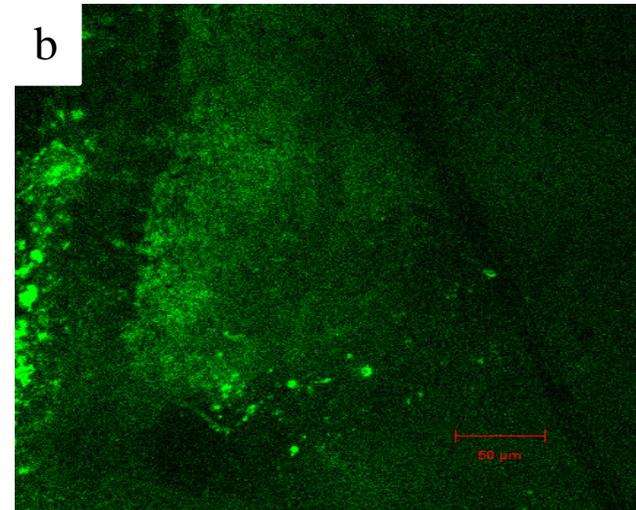
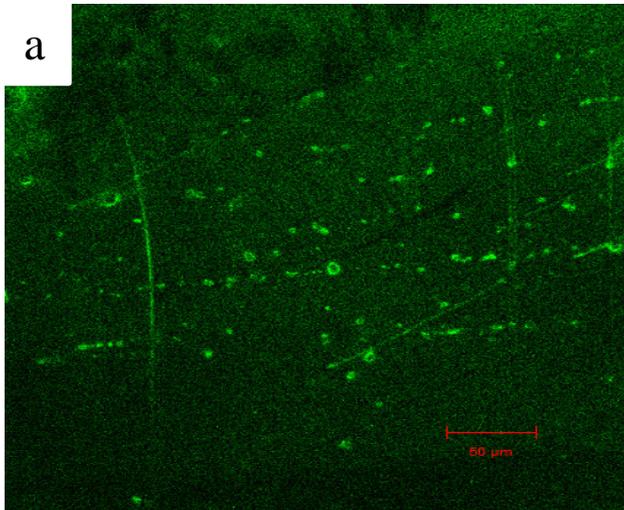
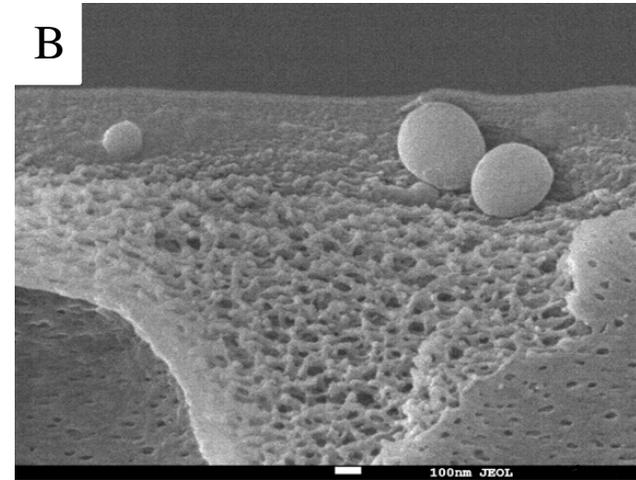
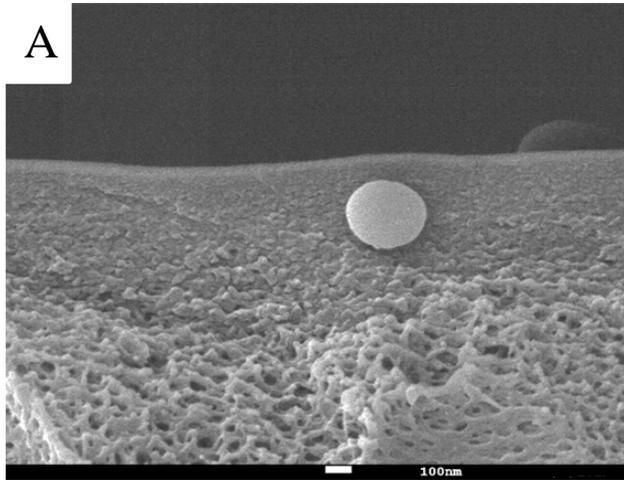


Figure 4 . Water flux and salt rejection of different membranes. Membrane without vesicles represents the PAI-PEI membrane without vesicles. Membrane with mutants or AQPs represents the membrane crosslinked with vesicles with mutants or AQPs (LPR 400).



AQPs (LPR 400)

Mutants (LPR 400)

Figure 5. FESEM images (A and B, scale bar 100 nm) and confocal fluorescence microscopy images (a and b, scale bar 50 μm) of different membranes with LPR 400.

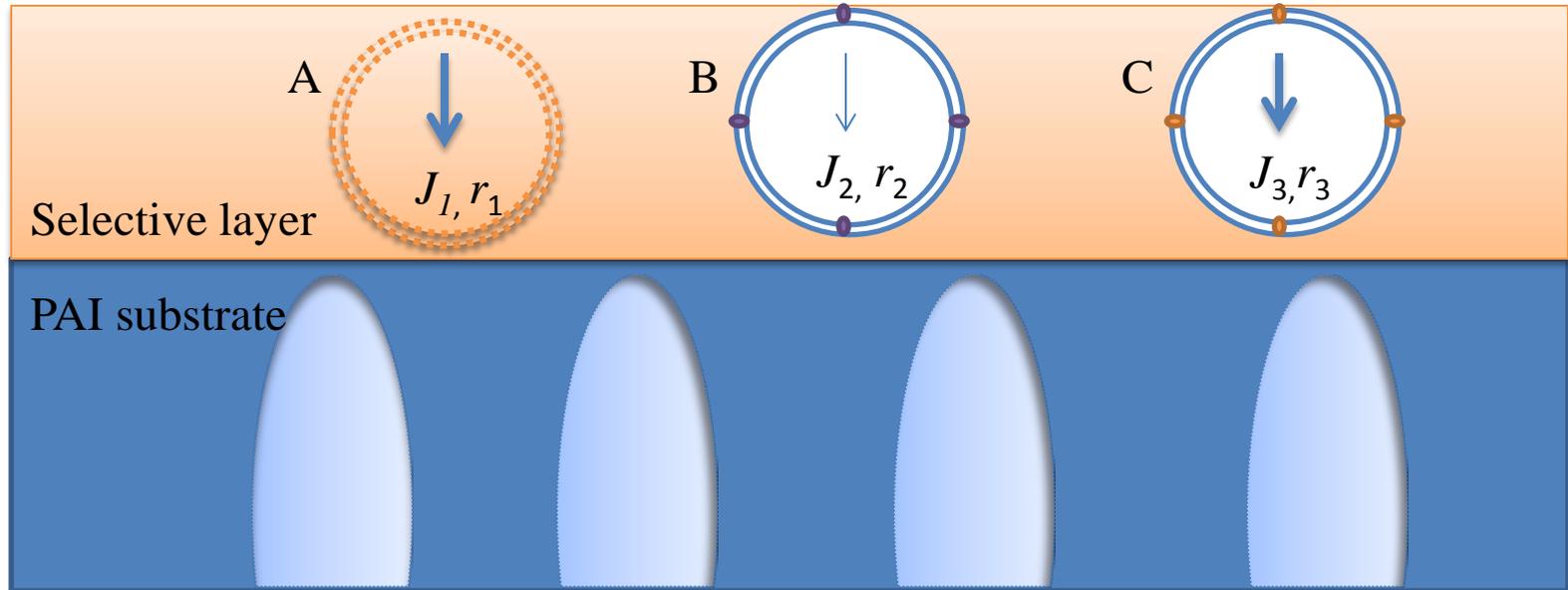


Figure 6. Schematic illustration of different membrane types. A represents the crosslinked PEI area with the same size as a vesicle; B represents the proteoliposome with mutants; C represents the proteoliposome with AqpZ. (not to scale)

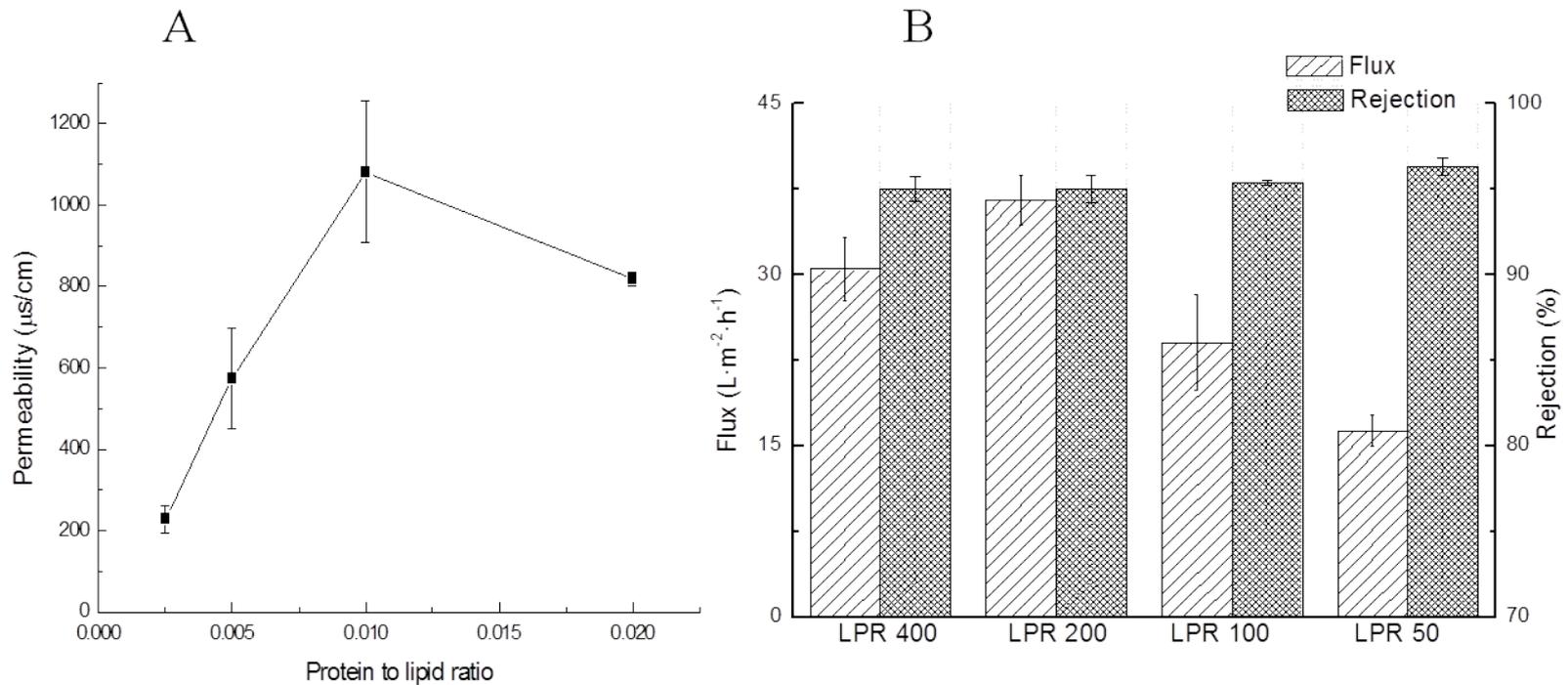


Figure 7. (A) Permeability of proteoliposomes after PDA coating and thermal treatment (70 °C, 2h) at different protein-to-lipid ratios and (B) water flux and salt rejection of membranes at different LPRs

Table 1 Properties of liposome, proteoliposome with AqpZ and mutants in Tris buffer

	Mean size (diameter/nm)	Polydispersity index (PDI)	Zeta potential (mv)	Permeability ($\mu\text{m/s}$)
Liposome	139.8	0.132	-15.8	34.9
Proteoliposome with AqpZ (LPR 400)	107.8	0.094	-20.3	266.9
Proteoliposome with mutants (LPR 400)	108.8	0.087	-21.5	84.6

Table 2. Comparison of different AQP based biomimetic NF membranes

Approaches of preparing nanofiltration membranes	Permeability (L·m ⁻² ·h ⁻¹ ·bar ⁻¹)	Salt rejection (%) (test conditions)	Membrane area (cm ²)	Reference
Proteopolymersomes fused on silanized cellulose acetate membrane	34.19±6.90	32.86±9.12 (200 ppm NaCl, 5bar)	0.07065	[8]
Proteopolymersomes fused on gold-coated porous alumina membrane	8.2±5.1	45.1±4.2 (200 ppm NaCl, 5bar)	0.20	[6]
Immobilized proteoliposomes were crosslinked on a pretreated PAN membrane	~2.8	~90 (200 ppm MgCl ₂ , 5bar)	0.785	[9]
Immobilized proteoliposomes were coated by a layer-by-layer assembled film on PAN membrane	~6.1	~95.8 (200 ppm MgCl ₂ , 4bar)	0.785	[10]
Immobilized proteopolymersomes were coated by a layer formed by polymerization	22.9	~75 (200 ppm MgCl ₂ , 5bar)	0.196	[12]
Proteoliposomes were totally embedded in a selective layer by crosslinking on a PAI membrane	36.6±2.2	95.0±0.70 (100 ppm MgCl ₂ , 1bar)	28.26	Present work
Commercial NF-270 flat sheet	15.9±1.1	98.5±0.5 (1mM Na ₂ SO ₄ , 1bar)	—	Present work
Commercial NTR-7450 flat sheet	10.1±1.1	98.3±0.9 (1mM Na ₂ SO ₄ , 1bar)	—	Present work