Supporting Information for

Surface Characteristics of Thin Film Composite Polyamide Membranes Dictate Silver Nanoparticle Loading Efficacy

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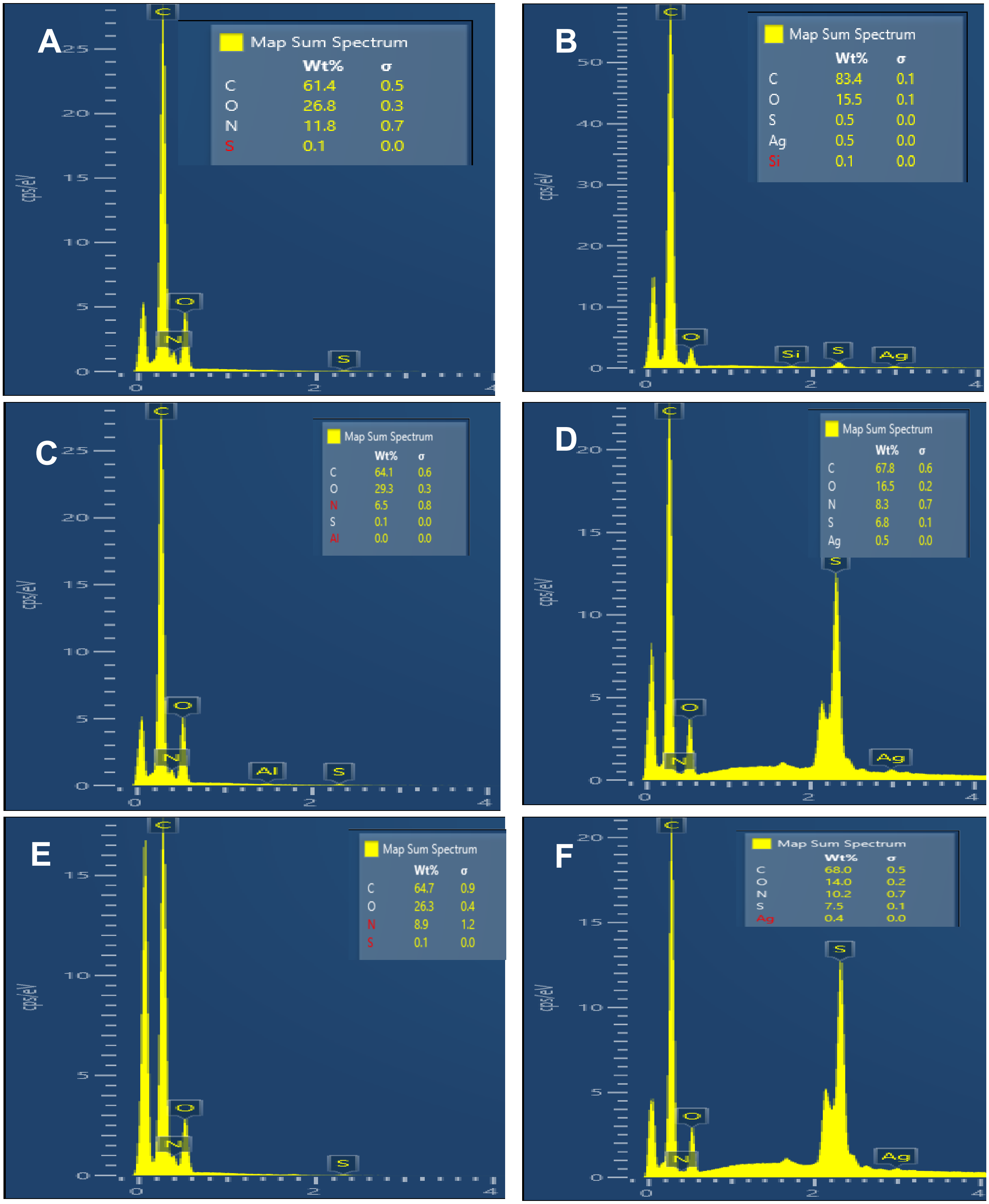
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cps/eV
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cps/eV
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cps/eV
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cps/eV
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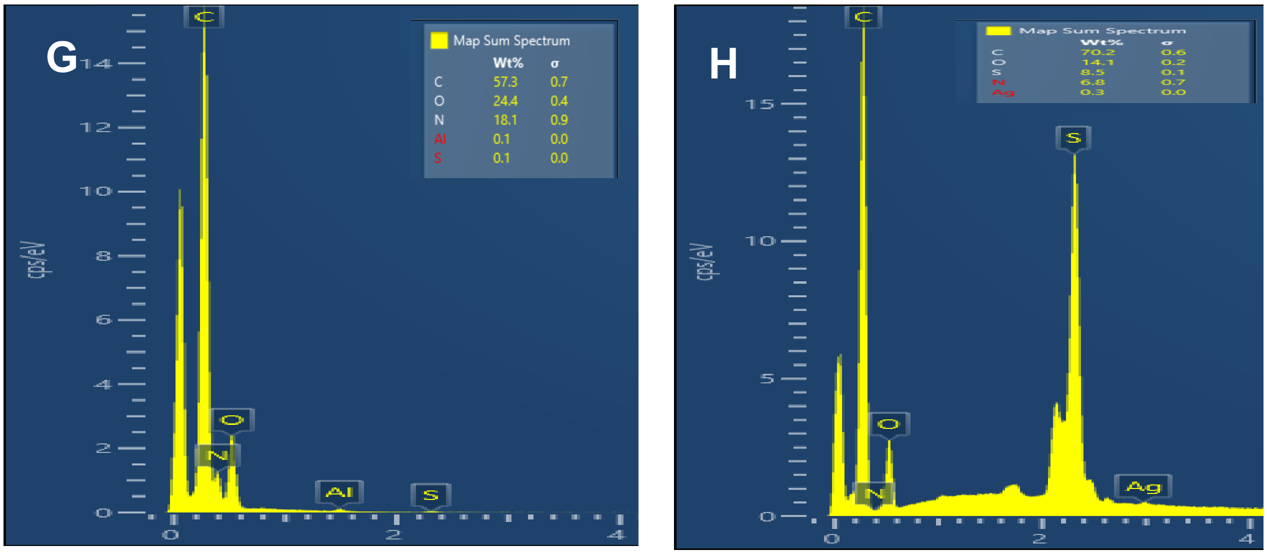

Figure S1. EDS spectra of **(A,C,E,G)** pristine and **(B,D,F,H)** AgNP-loaded SW 30, BW 30, AMI H, and NF 270 membranes.

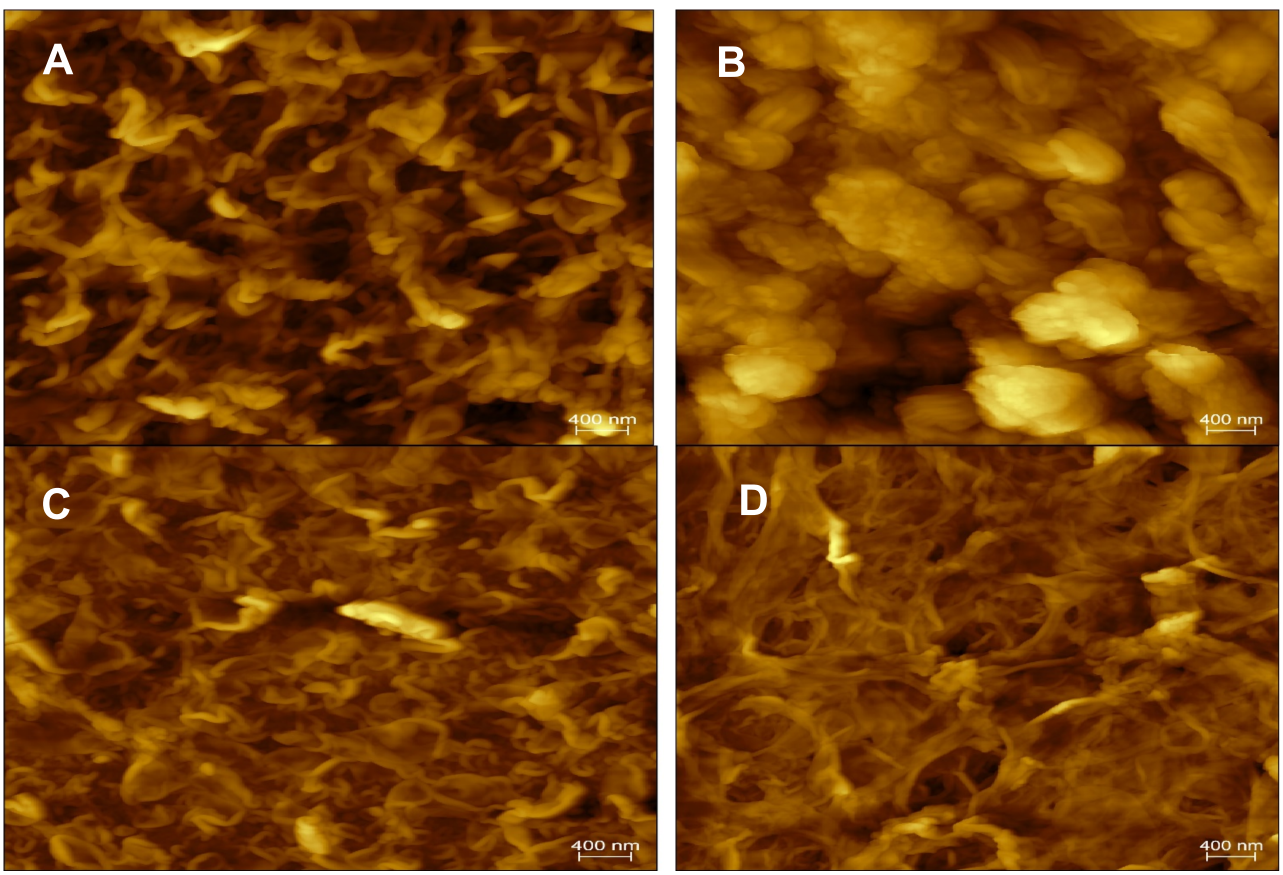

Figure S2. AFM-based surface topography images of pristine membranes **(A)** BW 30, **(B)** SW 30, **(C)** AMI H, and **(D)** NF 270.

Table S1. Summary of antimicrobial efficacy and water flux with silver loading by functionalizing different functional components.

AgNPs preparation	**Materials**	**Required amount**	**Loading μg/cm²**	**Bacterial inactivation %**	**Water permeability coefficient L m⁻² h⁻¹ bar ⁻¹**	**Salt rejection coefficient L m⁻² h⁻¹**	**Ref.**
precursor: $AgNO_3$ reducing agent: $NaBH_4$	-	-	-	-	pristine: 2.41±0.14	pristine: 0.28±0.05	[1]
	SW 30	1:1 mM	0.8±0.02	90.7±3.8% (*E. coli*)	2.12±0.20	0.22±0.01	
		2:2 mM	1.5±0.03	91.2±2.6% (*E. coli*)	2.01±0.10	0.21±0.02	
		5:5 mM	3.7±0.4	90.7±3.8% (*E. coli*)	2.01±0.12	0.27±0.02	
	cellulose fibers	100:800 mM	13.4	almost 100% (*E. coli*)	-	-	[2]
	blotting paper	10:1 mM	2.2±0.7	CFU/mL reduced from 10^9 to 10^5 (*E. coli*)	-	-	[3],[4]
		25:1 mM	6.0±1.4				
	stainless steel	300:300 mM	1.463	CFU decreased from 60.9% to 25.1% (*E. coli*)	-	-	[5]
	BW 30	3:3 mM	4.1±0.16	-	-	-	this study
	SW 30	3:3 mM	2.9±0.3	-	-	-	
	AMI H	3:3 mM	2.8±0.5	-	-	-	
	NF 270	3:3 mM	2.3±0.13	-	-	-	
PDA+AgNP	XLE	PDA: 0.4 g $AgNO_3$: 4 g/L	0.2 to 13.3	42.4±5.7% (*E. coli*)	reduced from 54.3±1.4 to 32.1±2.8 L m⁻² h⁻¹	NaCl reduction reduced to ~10%	[6]
				62.7±9.3% (*B. subtilis*)			
Ag-zeolite coating using PVA and PDA	NF 90	$AgNO_3$: 0.1 N zeolite: 0.05 g PVA: 0.23 to 0.43 g dopamine HCl: 2 mg/mL	1.85 to 3.75	CFU/mL reduced from ~10^8 to ~10^5 (*P. aeruginosa*)	-	-	[7]
GO/Ag	TFC FO	GO: 100 mg, $AgNO_3$: 5mM $NaBH_4$: 5 mM	4	-	water flux increase 3% for FO and 13% for RO	decreased ~2.5% for FO and increased ~3.5% for RO	[8]

Table S2. Binding energies and atomic percentages of bonds on pristine RO and NF membranes.

Sample label	Peak @ 284.6 eV		Peak @ 286.0 eV		Peak @ 287.6 eV	
	$\delta_{BE\ (eV)}$	%	$\delta_{BE\ (eV)}$	%	$\delta_{BE\ (eV)}$	%
SW 30	1.9	78.2	0.8	14.8	1.2	6.9
BW 30	2.0	53.8	2.0	40.7	1.8	5.9
AMI H	2.4	60.7	0.8	10.9	2.3	14.3
NF 270	3.0	63.5	3.0	20.1	3.2	16.4

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