membranes

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Supplementary Information

The Application of Principal Component Analysis (PCA) for the Optimization of the Conditions of Fabrication of Electrospun Nanofibrous Membrane for Desalination and Ion Removal

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Table S1: Published results on single polymer/layer ENMs for desalination and ion removal (from Sanaeepur et al. [22])

Dope		V (kV)	Q_d ($mL \cdot h^{-1}$)	T-to-C(cm)	N (mm)	d_p (μm)	δ (μm)	WCA (°)	LEP (kPa)	ε (%)
• P: PMMA (20 wt%) • S: DMF + acetone	1	18	9.6	30	-	0.41	161	164	227	83
• P: SAN (22.5 wt%) • S: DMF	2	18	16.2	30	0.68	0.18	105	133	118	70
• P: PS (18 wt%) • S: DMF	3	18	7.02	30	0.83	0.56	65	154	38	74
• P: PVDF + TBAC + FA • S: DMF + acetone	4	30	1	15	-	0.235	60	137	230	70
• P: PAN (10 wt%) • S: DMF	5	10	0.5	-	0.8	-	-	-	-	-
• M: keratin (15 wt%) • S: formic acid	6	25	0.06	20	0.2	-	50	-	-	90
• P: PAN (2,6, 10 &12 wt%) • S: DMF	7	17.5	0.6	10	0.2	-	-	-	-	-
• P: PTFE emulsion + PVA • S: Water	8	15	-	15	-	-	156	150	165	79.8
• P: matrimid (18 wt%) • S: NMP	9	30	1	17	0.26	2.25	-	130	-	-
• P: matrimid (25 wt%) • S: DMF + acetone	10	24	1.23	27.7	0.6	-	-	-	35	-
• P: PVDF (5-15 wt%_ • S: DMF +acetone	11	24	-	15	-	0.545	71	136	-	54
• P: PS (20 wt%) • S: DMF	12	18	0.1	17	0.83	0.235	-	145.5	-	75
• P: PS (18 wt%) • S: DMF	13	18	0.1	17	0.83	5.1	-	128	121	75
• P: PVDF (18 wt%) • S: DMF	14	18	2	18	-	0.32	150	-	-	76

• P: PAN (10-12 wt%) • S: DMF	15	20	0.2	-	0.521	-	-	37	-	-
• P: PAN (12 wt%) • S: DMAc	16	15	1	15	0.3	-	90	-	-	89
• P: PAN (8-12 wt%) • S: DMF	17	16	0.9	-	0.6	0.55	190	130	-	-
• P: PVDF (18 wt%) • S: DMF	18	18	2	18	-	-	150	-	-	-
• P: PAN (10 and 15 wt%) • S: DMF	19	20	1	15	0.5	-	-	-	-	-
• P: PVDF-HFP (14 wt%) • S: DMF + acetone	20	20	1	15	0.51	-	350	-	-	-
• P: PVDF-HFP (14 wt%) + Polypyrrole • S: DMF + acetone	21	20	1	15	0.51	-	350	-	-	-
• P: PSf (20 wt %) • S: DMF	22	12	4	15	0.21	2.9	135	-	12.4	-
• P: PVDF (15 wt%) • S: DMAc + acetone	23	15	2	15	0.21	7.3	300	145	-	-

Table S2. Published results on dual and triple layer ENMs for desalination and ion removal (membrane characterization; from Sanaeepur et al. [22])

Membrane characterization							
Layers		**Fd (nm)**	**dp (μm)**	**δ (μm)**	**WCA (°)**	**ε (%)**	**LEP (kPa)**
Top: SAN (17.5 wt%) + DMSO/acetone Middle: - Support: PAN (10 wt%) + DMF	1	300	0.28	97	155	76	169
Top: HIPS (22&25 wt %) + DMF Middle: SBR (8 wt%) + DMF/THF Support: PP	2	601	0.43	160	154	71	181
Top: FAS functionnalized PVDF-HFP Middle: - Support: PVDF-HFP	3	-	0.49	111	160	86	187
Top: HIPS (22 wt %) + DMF/acetone Middle: - Support: SAN (24 wt%) + DMF/acetone	4	536.5	0.43	173	143	77.8	135.6
Top: PVDF+PDMS Middle: - Support: PVDF-HFB	5	-	0.43	88	170	77	129
Top: PVDF+DMF/acetone Middle: - Support: nonwoven fabrics	6	133	1.65	190	140	66	43.5
Top: PDMS Middle: - Support: PVDF-HFP (15 wt%)	7	-	0.49	102	155.4	87	126
Top: PVA (4-8 wt%) Middle: - Support: PP	8	-	0.08	48	105	-	-
Top: PVDF-HFP (20 wt%) Middle" - Support: PVA, Nylon 6, PAN	9	239.3	0.34	128	148	89	122.3
Top: Chitosan + PVA (8 wt%) Middle: - Support: PAN	10	932	0.6	-	-	87	-
Top: PVDF-HFP (15 wt%) Middle: - Support: PAN (8 wt%)	11	225	1.55	81	150	90	85.5

Top: Silica + FS10 Middle: - Support: PVDF	12	180	0.83	72	150	80	150
Top: Polyaniline Middle: - Support: PAN	13	200	-	50	-	70	-
Top: PVDF Middle: PVDF Support: PAN	14	-	0.1	175	145	-	350
Top: PVDF-HFP(10 wt%) Middle: - Support: PVDF-HFP	15	200	0.26	110	126	60	131.6

Table S3. Published results on dual and triple layer ENMs for desalination and ion removal (membrane fabrication; from Sanaeepur et al. [22])

Membrane characterization	**Membrane fabrication (electrospinning)**					
Layers		**HV**	**Qd**	**N**	**T-to-C (cm)**	**Qa (NL.min-1)**
Top: SAN (17.5 wt%) + DMSO/acetone Middle: - Support: PAN (10 wt%) + DMF	1	18	5.4	18	30	2
Top: HIPS (22&25 wt %) + DMF Middle: SBR (8 wt%) + DMF/THF Support: PP	2	18	5.4	18	30	2
Top: FAS functionnalized PVDF-HFP Middle: - Support: PVDF-HFP	3	16	0.8	-	15	0-4
Top: HIPS (22 wt %) + DMF/acetone Middle: - Support: SAN (24 wt%) + DMF/acetone	4	20	8.1	18	35	3
Top: PVDF+PDMS Middle: - Support: PVDF-HFB	5	18	1.5	-	8	-
Top: PVDF+DMF/acetone Middle: - Support: nonwoven fabrics	6	16	1.5	18	15	-
Top: PDMS Middle: - Support: PVDF-HFP (15 wt%)	7	18	0.7	-	15	-

Top: PVA (4-8 wt%) Middle: - Support: PP	8	16	0.3	-	13	-
Top: PVDF-HFP (20 wt%) Middle" - Support: PVA, Nylon 6, PAN	9	21	0.8	-	20	-
Top: Chitosan + PVA (8 wt%) Middle: - Support: PAN	10	13	0.2	-	10	-
Top: PVDF-HFP (15 wt%) Middle: - Support: PAN (8 wt%)	11	20	1	21	15	-
Top: Silica + FS10 Middle: - Support: PVDF	12	26	1.2	-	12	-
Top: Polyaniline Middle: - Support: PAN	13	14	1.2	-	10	-
Top: PVDF Middle: PVDF Support: PAN	14	16	2	-	15	-
Top: PVDF-HFP(10 wt%) Middle: - Support: PVDF-HFP	15	20	1	18	15	-

Table S4. Published results on dual and triple layer ENMs for desalination and ion removal (membrane performance; from Sanaeepur et al. [22])

Membrane characterization	**Membrane Performance**				
Layers	**Feed**	**delta T**	**Qf**	**Qp**	**F**
Top: SAN (17.5 wt%) + DMSO/acetone Middle: - Support: PAN (10 wt%) + DMF	35	40	0.48	0.24	37-84
Top: HIPS (22&25 wt %) + DMF Middle: SBR (8 wt%) + DMF/THF Support: PP	100	40	0.48	0.24	18.33
Top: FAS functionnalized PVDF-HFP Middle: - Support: PVDF-HFP	1 M NaCl + 20 mM CaCl2	40	30 L/h	30 L/h	0.9-1
Top: HIPS (22 wt %) + DMF/acetone Middle: - Support: SAN (24 wt%) + DMF/acetone	-	40	0.48	0.4	23.56

Top: PVDF+PDMS **Middle: -** **Support: PVDF-HFB**	-	40	-	-	36
Top: PVDF+DMF/acetone **Middle: -** **Support: nonwoven fabrics**	3.5 % NaCl solution	60	4800	4800	49.3
Top: PDMS **Middle: -** **Support: PVDF-HFP (15 wt%)**	-	40	0.5	0.5	34
Top: PVA (4-8 wt%) **Middle: -** **Support: PP**	-	20	-	-	7
Top: PVDF-HFP (20 wt%) **Middle" -** **Support: PVA, Nylon 6, PAN**	-	40	-	-	44484
Top: Chitosan + PVA (8 wt%) **Middle: -** **Support: PAN**	-	-	-	-	320
Top: PVDF-HFP (15 wt%) **Middle: -** **Support: PAN (8 wt%)**	35	40	-	-	30
Top: Silica + FS10 **Middle: -** **Support: PVDF**	3.5 wt%	40	-	-	24.6
Top: Polyaniline **Middle: -** **Support: PAN**	-	-	-	-	-
Top: PVDF **Middle: PVDF** **Support: PAN**	3.5 wt%	60	-	-	16
Top: PVDF-HFP(10 wt%) **Middle: -** **Support: PVDF-HFP**	-	30	-	-	20-22