Supplementary Material

Ultrafiltration and Nanofiltration for the Removal of Pharmaceutically Active Compounds from Water: The Effect of Operating Pressure on Electrostatic Solute-Membrane Interactions

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Supplementary Material includes 5 figures and 2 tables.

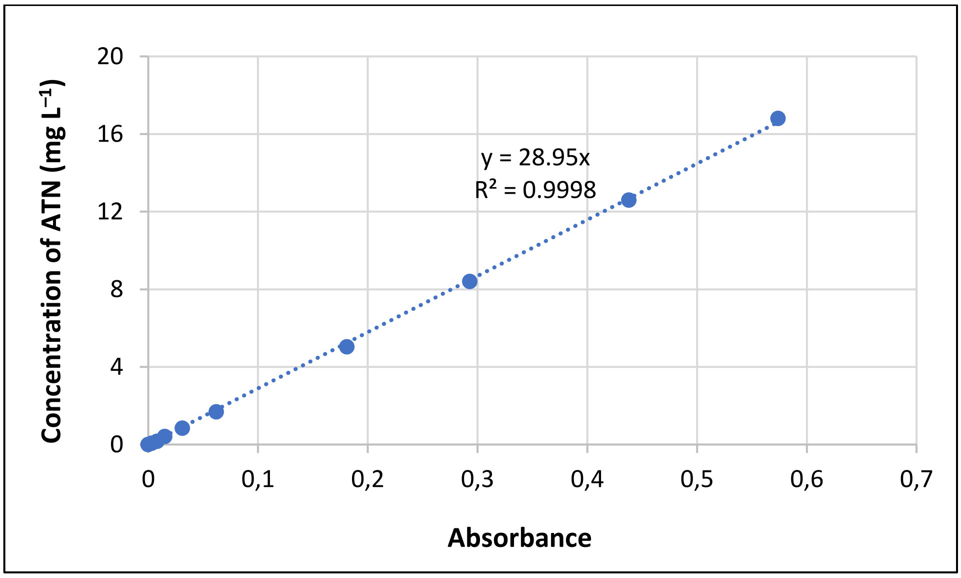

Figure S1. Calibration curve for determination of atenolol (ATN) by spectrophotometric method. ATN concentration versus absorbance at 226 nm (wavelength of maximum absorption).

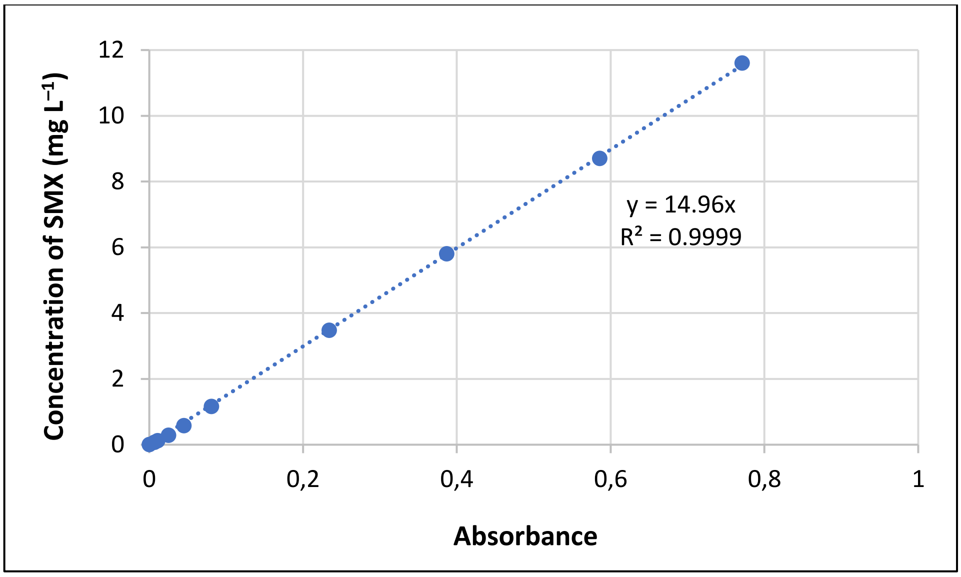

Figure S2. Calibration curve for determination of sulfamethoxazole (SMX) by spectrophotometric method. SMX concentration versus absorbance at 265 nm (wavelength of maximum absorption).

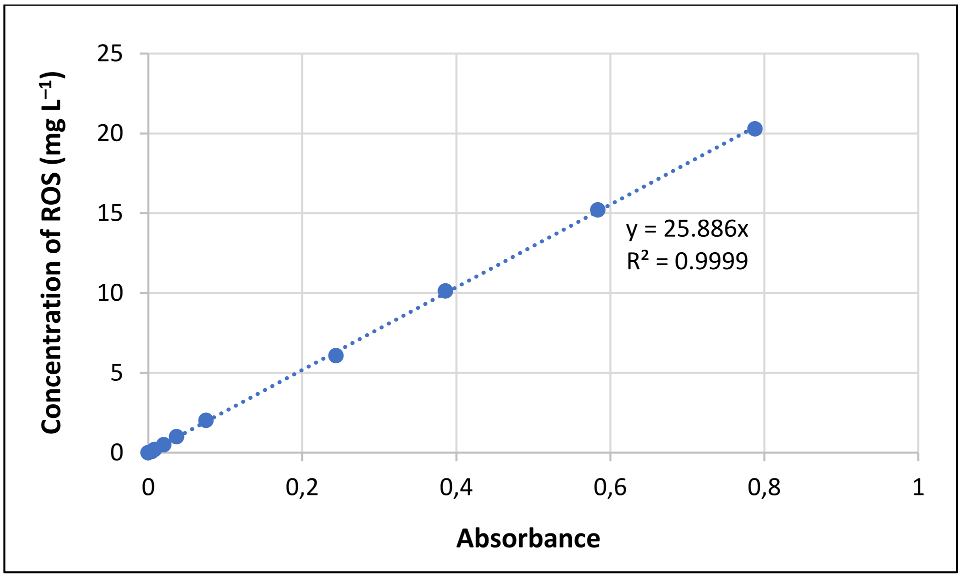

Figure S3. Calibration curve for determination of rosuvastatin (ROS) by spectrophotometric method. ROS concentration versus absorbance at 242 nm (wavelength of maximum absorption).

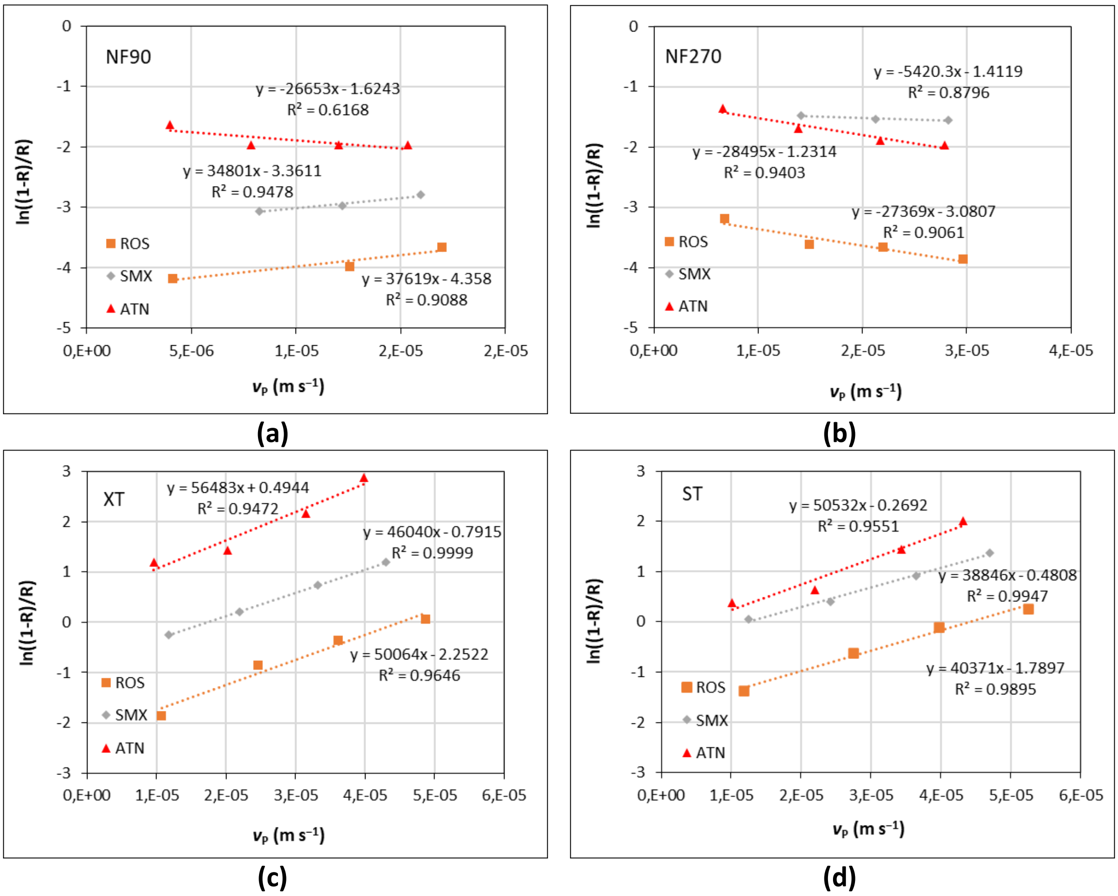

Figure S4. Variation of ln((1 – R)/R) with the permeation velocity (v_P) of PhACs solutions for membranes: a) NF90; b) NF270; c) XT; and d) ST.

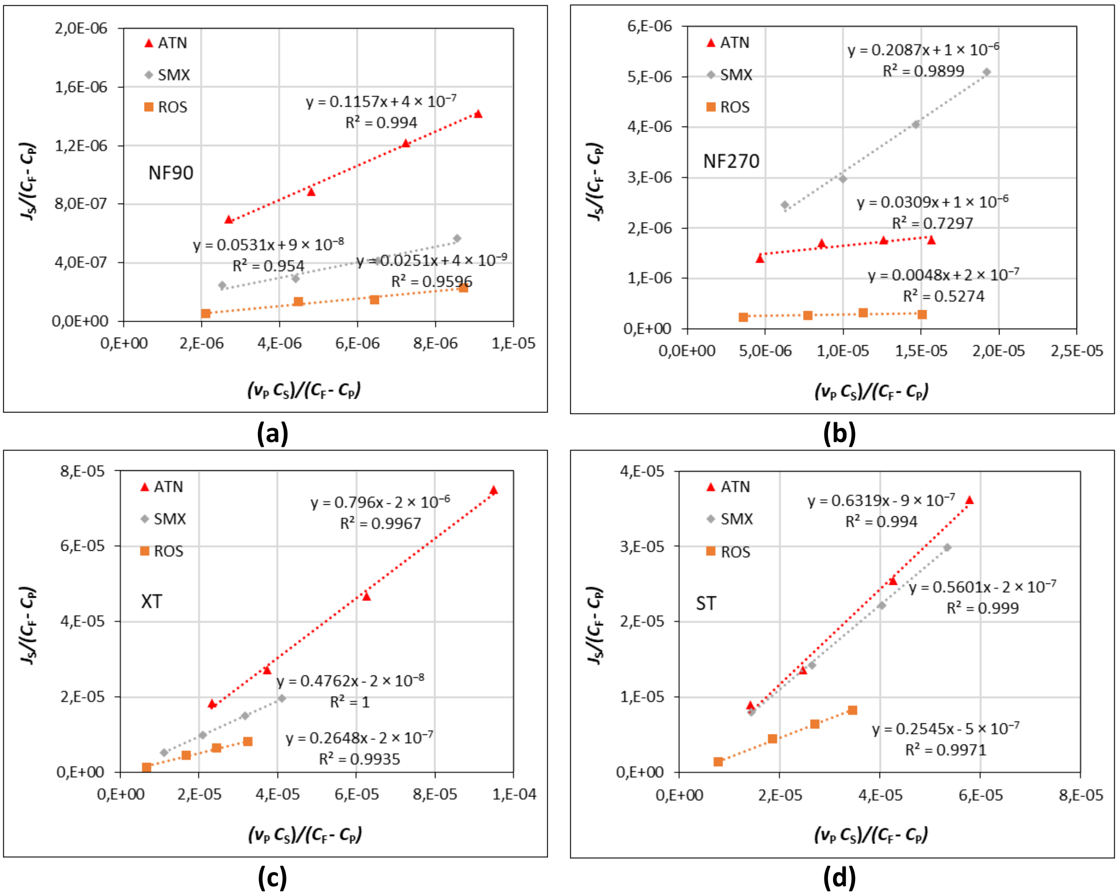

Figure S5. Variation of $J_S/(C_F - C_P)$ with $(v_P C_S)/(C_F - C_P)$ of PhACs solutions for membranes: a) NF90; b) NF270; c) XT; and d) ST. SKK model.

Table S1. Mean concentration of PhACs (ATN, SMX and ROS) in the bulk feed solution (C_F), in the permeate (C_P), at the boundary layer adjacent to the membrane surface (C_M) determined by Film Theory, as well as the concentration polarization module assessed in the different operating pressures.

PhAC	ΔP	C_F	NF90			NF270			XT			ST		
			C_M	C_P	$\frac{(C_M - C_P)}{(C_F - C_P)}$	C_M	C_P	$\frac{(C_M - C_P)}{(C_F - C_P)}$	C_M	C_P	$\frac{(C_M - C_P)}{(C_F - C_P)}$	C_M	C_P	$\frac{(C_M - C_P)}{(C_F - C_P)}$
	(bar)	(mg L^{-1})	(mg L^{-1})	(mg L^{-1})		(mg L^{-1})	(mg L^{-1})		(mg L^{-1})	(mg L^{-1})		(mg L^{-1})	(mg L^{-1})	
ATN	2	3.55	3.88	0.58	0.54	4.13	0.72	0.70	4.15	2.72	1.09	4.52	2.12	1.43
	4	3.55	4.28	0.43	0.47	5.01	0.55	0.69	5.00	2.87	1.72	6.07	2.32	2.45
	6	3.55	4.73	0.43	0.53	6.19	0.46	0.75	5.34	3.19	1.93	6.73	2.87	3.12
	8	3.55	5.12	0.43	0.57	7.33	0.43	0.84	5.14	3.36	1.69	6.86	3.13	3.29
SMX	2	3.94	4.58	0.24	0.26	4.06	0.99	0.77	5.52	1.73	1.66	5.15	2.01	1.60
	4	3.94	5.19	0.18	0.23	4.19	0.73	0.64	7.02	2.18	2.68	6.40	2.37	2.43
	6	3.94	5.93	0.19	0.28	4.34	0.69	0.64	8.56	2.66	3.99	7.45	2.82	3.31
	8	3.94	6.70	0.23	0.38	4.48	0.69	0.66	9.67	3.03	5.11	8.08	3.14	3.94
ROS	2	4.99	5.81	0.08	0.09	5.96	0.20	0.23	5.96	0.68	0.72	7.42	1.01	1.30
	4	4.99	6.88	0.10	0.14	7.45	0.13	0.19	9.73	1.50	2.47	11.60	1.74	3.44
	6	4.99	7.96	0.09	0.15	9.01	0.13	0.22	13.58	2.05	4.74	15.50	2.35	6.19
	8	4.99	9.34	0.13	0.23	11.09	0.10	0.23	17.84	2.57	7.87	20.91	2.82	10.22

Table S2. Values of experimental (apparent), intrinsic, and calculated rejections by SD and SKK models for ATN, SMX, and ROS at pressures from 2 to 8 bar.

PhAC	ΔP (bar)	NF90				NF270				XT				ST			
		Exp.	Film	SD	SKK	Exp.	Film	SD	SKK	Exp.	Film	SD	SKK	Exp.	Film	SD	SKK
		R (%)	R' (%)	R_{SD} (%)	R_{Skk} (%)	R (%)	R' (%)	R_{SD} (%)	R_{Skk} (%)	R (%)	R' (%)	R_{SD} (%)	R_{Skk} (%)	R (%)	R' (%)	R_{SD} (%)	R_{Skk} (%)
ATN	2	83.67	83.54	81.66	83.95	79.59	77.41	71.97	85.24	23.27	37.89	34.28	20.05	40.41	56.69	48.32	36.79
	4	87.76		78.68	87.27	84.49		63.37	91.63	19.18		1.60	20.39	34.69		19.35	36.81
	6	87.76		76.17	88.11	86.94		52.92	93.87	10.20		0.86	20.40	19.18		17.00	36.81
	8	87.76		73.98	88.31	87.76		43.33	94.77	5.31		17.73	20.40	11.84		19.83	36.81
SMX	2	94.01	96.65	96.18	94.32	74.91	80.41	80.98	75.13	56.18	68.82	56.35	52.38	48.88	61.79	50.84	43.99
	4	95.51		95.58	94.65	81.46		78.57	78.22	44.57		44.35	52.38	39.89		36.67	43.99
	6	95.13		94.95	94.69	82.40		77.47	78.93	32.40		32.15	52.38	28.46		27.34	43.99
	8	94.19		94.30	94.69	82.58		76.55	79.08	23.22		23.52	52.38	20.22		22.49	43.99
ROS	2	98.48	98.74	98.53	97.49	96.06	95.61	96.69	96.88	86.45	90.48	88.87	73.52	79.72	85.69	78.55	74.50
	4	97.94		98.26	97.49	97.38		93.27	98.42	69.96		82.66	73.52	65.08		67.02	74.55
	6	98.15		97.98	97.49	97.49		91.82	98.84	58.88		75.70	73.52	52.91		55.99	74.55
	8	97.49		97.64	97.49	97.94		89.88	99.06	48.45		67.83	73.52	43.47		39.47	74.55