Electronic Supplementary Material (ESI) for Environmental Science: Water Research & Technology.

Impact of pretreatment on RO membrane organic fouling: Composition and adhesion of tertiary wastewater effluent organic matter

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Supplementary material

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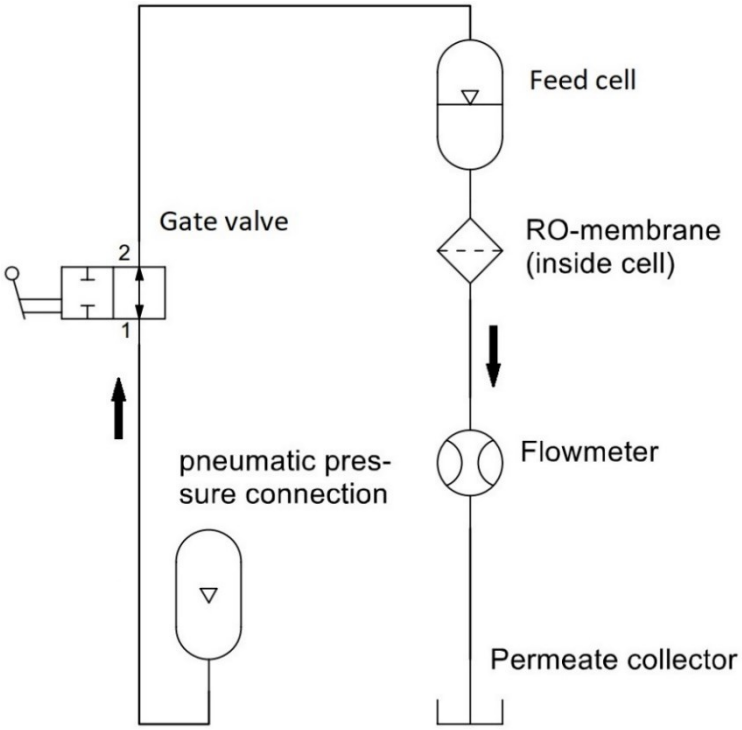
A) ICP analysis of the treated waste waters from Herzeliya WWTP

Table S1: ICP analysis of the treated waste waters from Herzeliya WWTP

Ion Type	TWW [mg L-1]	TWW+BF [mg L-1]	TWW+UF [mg L-1]	Average [mg L-1]
Al3+	ND	ND	ND	ND
B3+	ND	ND	ND	ND
Ba2+	0.09	0.10	0.10	0.09 ± 0.01
Ca2+	70.82	70.65	69.20	70.23 ± 0.89
Cr3+	ND	ND	ND	ND
Cu2+	ND	ND	ND	ND
Fe2+	ND	ND	ND	ND
K+	22.37	22.97	22.32	22.55 ± 0.36
Li+	ND	ND	ND	ND
Mg2+	17.22	17.15	16.80	17.06 ±0.22
Na+	118.77	120.46	117.09	118.78 ± 1.68
P	1.75	1.33	1.71	1.60 ± 0.23
S	20.24	21.01	19.89	20.38 ± 0.57
Si	6.81	6.90	6.71	6.81 ± 0.10
Sr2+	0.28	0.28	0.27	0.28 ± 0.01
Zn2+	0.02	0.02	0.03	0.02 ± 0.01
Cl-	158.00	158.00	162.50	159.50 ± 2.60
NO3-	21.00	21.50	20.50	21.00 ± 0.5
SO42-	52.50	54.00	54.00	53.50 ± 0.87
CaCO3	200	200	200	200



B) Dead-end RO filtration scheme

Figure S1: Dead-end RO filtration scheme

C) QCM-D: coating of the gold-coated sensors with aromatic polyamide layer

Prior to coating the gold-coated QCM-D crystals with aromatic polyamide, the crystals were treated as following, whereby step i-iii were followed by rinsing with ultrapure water:

(i) Incubation in pure N-Methyl-2-Pyrrolidone overnight, (ii) 5 min immersion in a piranha solution (75°C; 5:1:1 mixture (by volume) of 5 parts ultrapure water, 1 part ammonium hydroxide solution (30%) and 1 part hydrogen peroxide solution (30%)), (iii) 10 min immersion in a solution of pure Dimethylformamide (DMF) solution (75°C), (iv) drying in a jet stream of nitrogen gas (medical grade) and (iv) exposure to UV radiation for 10 minutes in a UV ozone cleaner (Pro cleaner plus, Bioforce Nanoscience, USA).

For spin coating of the gold-coated QCM-D crystals, a solution of 10 mL of DMF containing 2.5% (w/v) lithium chloride was mixed and filtered through a 0.2 µm syringe filter to remove any dust particles. This solution was later used to dissolve 30 mg of NOMEX, linear aromatic polyamide fibers (DuPont, USA) in a 50 mL flask connected to a reflux chamber, where the flask containing DMF and the Nomex material was submerged in a heated oil bath at 90 °C overnight. Then, 45 µL of the polyamide solution was added to the middle point of the sensor rotating at 40 rounds per second (rps). Spin coating rotation time of the sensor was 1 min. Finally, the coated sensor was carefully vacuum-dried for 2 h at 45 °C.

D) AFM high resolution topography of the surfaces

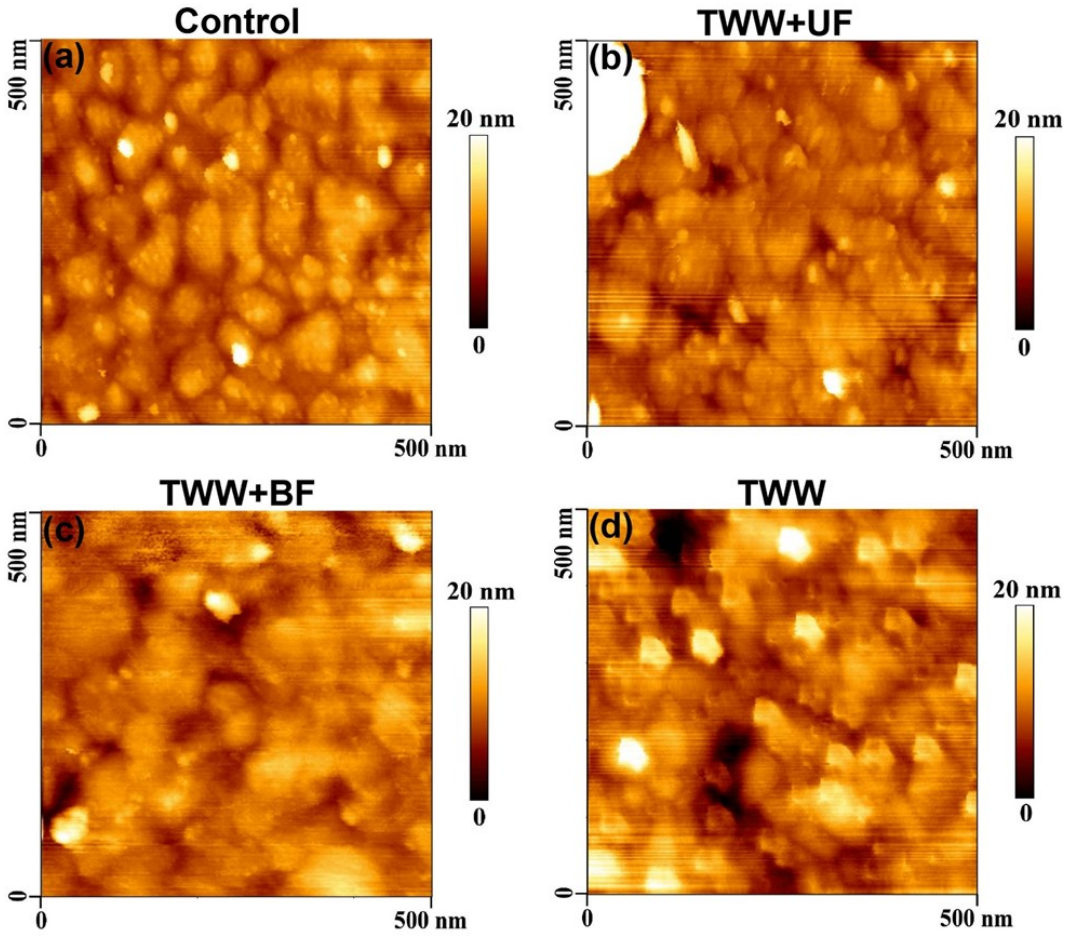


Figure S2. High resolution (500 * 500 nm) AFM topography describing the structural details of different surfaces; (a) Control (ie.: PA coated QCM-D sensor), (b) Ultrafilter pre-treated waste water (TWW+UF), (c) Bioactive filter pre-treated waste water (TWW+BF), (d) Tertiary waste water (TWW)

E) AFM adhesion micrographs

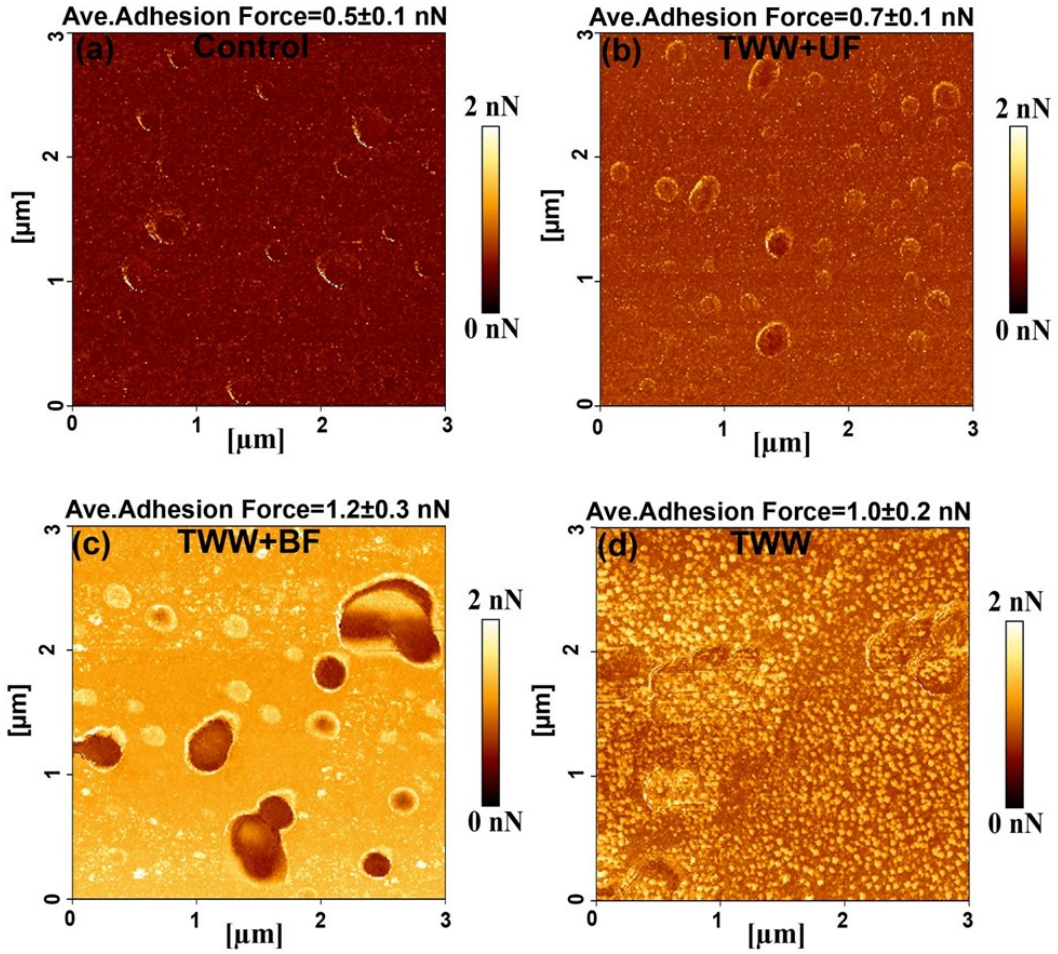


Figure S3. AFM adhesion micrographs (using sharp silicon nitride probes with tip radius ~ 2-12 nm) describing the adhesion intensities for an area of 3 x 3 µm; (a) Control (ie.: PA coated QCMD sensor), (b) Ultrafilter pre-treated wastewater (TWW+UF), (c) Bioactive filter pre-treated wastewater (TWW+BF), (d) Tertiary wastewater (TWW)

F) Chromatograms of the of the fractionated wastewater and recovery of fractionation

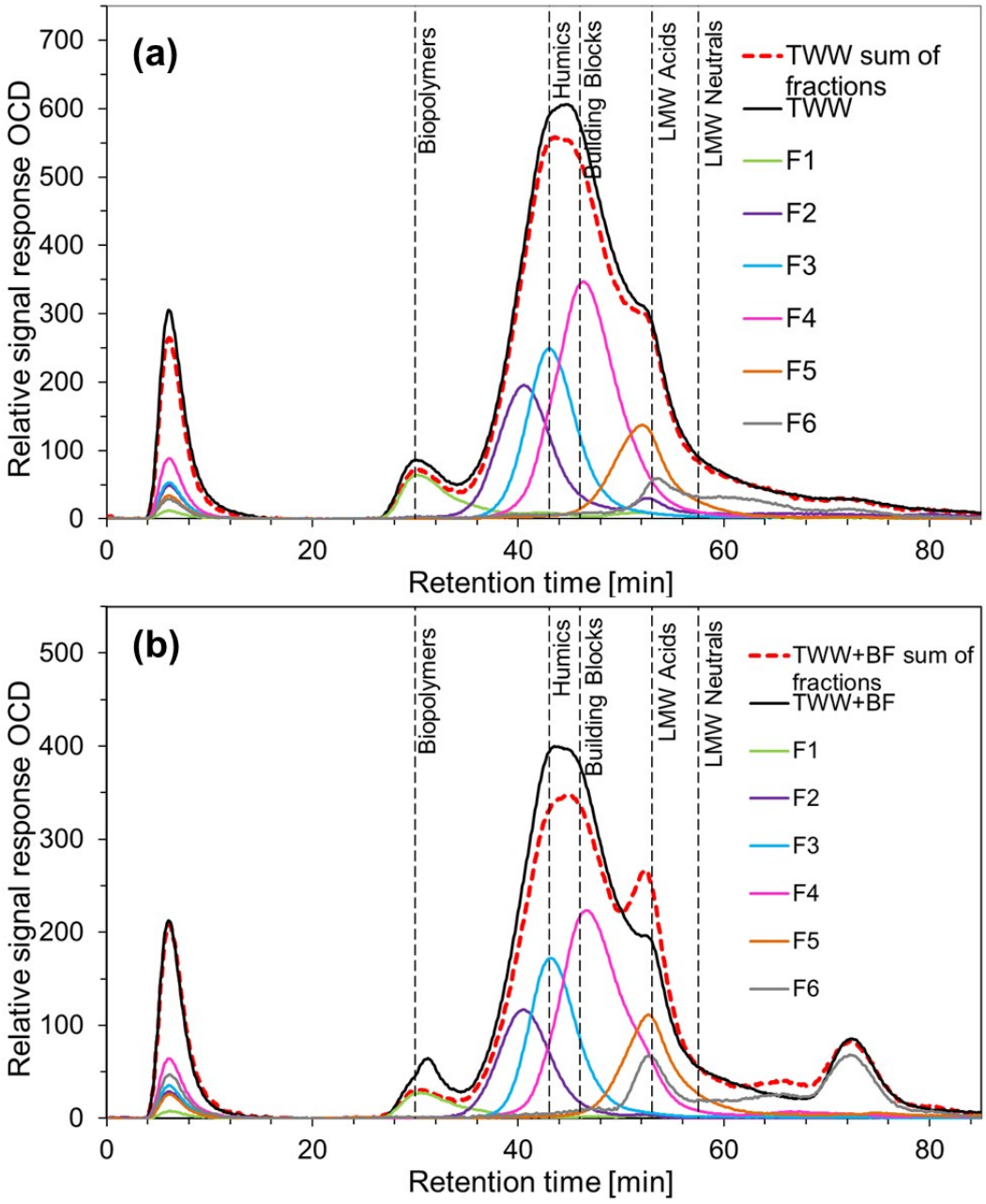


Figure S4. Chromatograms of the of the fractionated wastewater and the sum of the fractions as comparison to the original OCD signal (a) Tertiary wastewater (TWW), (b) Biofiltered tertiary wastewater (TWW+BF).

Table S2: Recovery rate of tertiary wastewater fractions

	Recovery of fractions [%]
TWW	92.4
TWW+BF	97.6
TWW+UF	102.3