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

Biofouling control by UV/H_2O_2 pretreatment for brackish water reverse osmosis process

Anat Lakretz[a], Hadas Mamane[a*] Eli Asa[b], Tali Harif[c], and Moshe Herzberg[b*]

[a] *School of Mechanical Engineering, Faculty of Engineering, Tel Aviv University, Tel Aviv 69978, Israel*
[b] *Ben Gurion University of the Negev, Blaustein Institutes for Desert Research, Zuckerberg Institute for Water Research, Sede Boqer Campus, Midreshet Ben Gurion, 84990 Israel. E-mail: herzberg@bgu.ac.il*
[c] *Severn Trent plc, Severn Trent Centre, 2 St John's St, Coventry, CV1 2LZ, UK*

Supplementary material

Text S1

Degradation of *p*CBA involves direct UV photolysis and indirect photo-oxidation by •OH radicals, as described by Rosenfeldt and Linden (2007) [1].

$$-\ln\frac{[pCBA]_t}{[pCBA]_0}/t = k_{obs} = k' + k_{pCBA,\bullet OH}\left[\bullet OH\right]_{ss} \quad (1)$$

$$k' = \phi_{pCBA} \times k_{s,pCBA} \quad (2)$$

$$k_{s,pCBA} = \sum_{200-300} \frac{10^{-3} \times \mathrm{E}_p^0(\lambda)\varepsilon_{pCBA}(\lambda)\left[1-10^{-a(\lambda)z}\right]}{a(\lambda)z} \quad (3)$$

$$\left[\bullet OH\right]_{ss} = \frac{k_{obs} - \phi_{pCBA} \times k_{s,pCBA}}{k_{pCBA,\bullet OH}} \quad (4)$$

Where, $[pCBA]_0$ and $[pCBA]_t$ are initial *p*CBA concentration (M) and its concentration after exposure time t (sec), respectively. k_{obs} and k' are the observed (total) and direct-photolysis time-based pseudo-first-order degradation rate constants of *p*CBA, respectively (1/sec). $[\bullet OH]_{ss}$ is the steady-state •OH radical concentration (M) and $k_{pCBA,\bullet OH}$ is the second-order rate constant of *p*CBA reaction with •OH, reported to be 5×10^9 1/M s. Φ_{pCBA} is the quantum yield for *p*CBA removal 0.0182 mole/Einstein, $k_{s,pCBA}$ is the specific rate of light absorption by *p*CBA (Einstein/mole sec). $E^0p(\lambda)$ is the incident photon irradiance (Einstein/cm^2 sec), $\varepsilon_{pCBA}(\lambda)$ is the molar (decadic) absorption coefficient of *p*CBA (1/M cm), $a(\lambda)$ is the solution absorption coefficient (1/cm) and z is the depth of solution (cm).

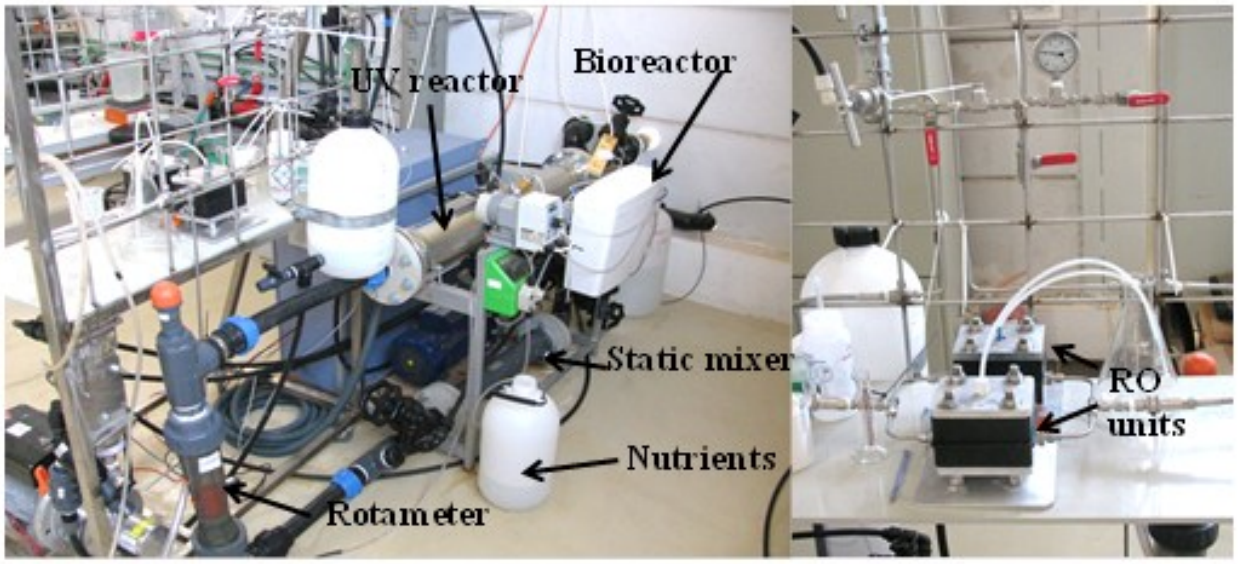
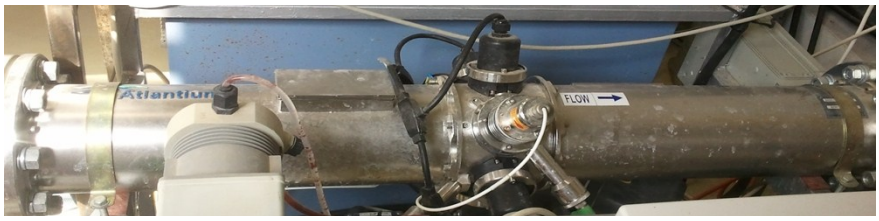


Fig. S1 RO lab unit experimental photo-image.

A



B

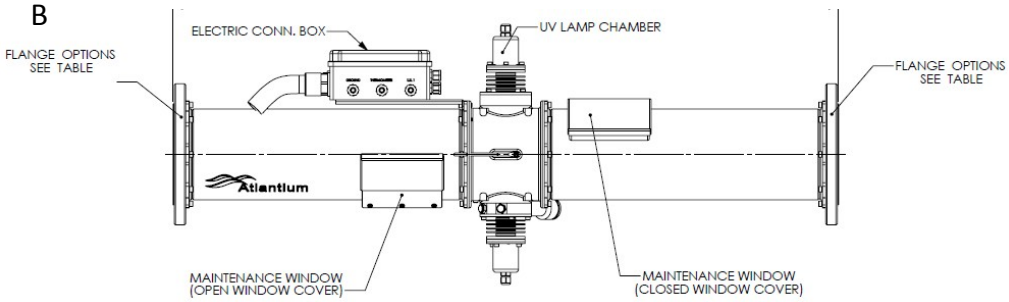


Fig. S2 Atlantium hydro-optic-disinfection (HOD^{TM}) RZ104-11 MP-UV reactor: (A) photo; (B) schematic illustration.

Reference

1 E. J. Rosenfeldt and K. G. Linden, *Environ. Sci. Technol.*, 2007, **41**, 2548–2553.