Near real-time N-nitrosodimethylamine monitoring in potable water reuse via online high-performance liquid chromatography-photochemical reaction-chemiluminescence

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Supporting Information

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<table>
<thead>
<tr>
<th>Compound</th>
<th>NDMA</th>
<th>NMEA</th>
<th>NPYR</th>
<th>NMOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
<td><img src="image" alt="Structure NDMA" /></td>
<td><img src="image" alt="Structure NMEA" /></td>
<td><img src="image" alt="Structure NPYR" /></td>
<td><img src="image" alt="Structure NMOR" /></td>
</tr>
<tr>
<td>Molecular Formula</td>
<td>C₂H₆N₂O</td>
<td>C₃H₈N₂O</td>
<td>C₄H₈N₂O</td>
<td>C₄H₈N₂O₂</td>
</tr>
<tr>
<td>Molecular Weight [g mol⁻¹]</td>
<td>74.05</td>
<td>88.06</td>
<td>100.06</td>
<td>116.06</td>
</tr>
</tbody>
</table>
Fig. S2 – Photograph of the online HPLC-PR-CL instrument with a 6-port valve.
Supporting information S3 – Method detection limits:

The method detection limits (MDLs) were determined based on the Method Detection Limit Procedure of the U.S. Environmental Protection Agency (40CFR 136, Appendix B, revision 1.11). MDLs with a 200 µL injection volume for NDMA, NMEA, NPYR and NMOR were 0.3, 0.7, 1.4 and 0.8 ng L\(^{-1}\), respectively. MDLs with a 20 µL injection volume for NDMA, NMEA, NPYR and NMOR were 2.7, 6.3, 7.7 and 11.8 ng L\(^{-1}\), respectively.
Fig. S4a – Schematic diagram of a wastewater recirculation system.

Fig. S4b – Schematic diagram of the RO treatment system. The system comprised of a 4-in. glass-fibre pressure vessel (ROPV, Nangang, China), 65-L stainless steel reservoir, a high-pressure pump (25NED15Z, Nikuni Co., Ltd., Kawasaki, Japan), digital flow meters (FDM, Keyence Co., Osaka, Japan), digital pressure indicators (GPM, Keyence Co., Osaka, Japan), a pressure gauge, stainless steel pipes in the feed stream and PVC pipes and PTFE tubing in the permeate stream. The membrane element was rinsed with pure water to eliminate residual preservatives on the RO element.
Fig. S5 – Online analysis of concentrations of N-nitrosamines in the UF-treated wastewater using the HPLC-PR-CL with a sample injection volume of 20 µL.
Fig. S6 – Online analysis of three N-nitrosamines (NMEA, NPYR and NMOR) in RO permeate (permeate flux = 20 L m$^{-2}$ h$^{-1}$, transmembrane pressure = 0.51 MPa). Concentrations of NMEA, NPYR, and NMOR in RO permeate were 900, 990 and 1040 ng L$^{-1}$, respectively.
**Fig. S7** – Online analysis of three N-nitrosamines (NMEA, NPYR and NMOR) in RO permeate (feed temperature = 20 °C, permeate flux = 20 L m⁻² h⁻¹, transmembrane pressure = 0.51 MPa). N-nitrosamine concentrations in the RO feed were determined based on manual samplings.