

Accepted Manuscript

Application of a hydroxyl-radical-based disinfection system for ballast water

Mindong Bai, Yiping Tian, Yixuan Yu, Qilin Zheng, Xiaofang Zhang, Wu Zheng, Zhitao Zhang



PII: S0045-6535(18)31083-X

DOI: [10.1016/j.chemosphere.2018.06.010](https://doi.org/10.1016/j.chemosphere.2018.06.010)

Reference: CHEM 21542

To appear in: *ECSN*

Received Date: 10 February 2018

Revised Date: 31 May 2018

Accepted Date: 2 June 2018

Please cite this article as: Bai, M., Tian, Y., Yu, Y., Zheng, Q., Zhang, X., Zheng, W., Zhang, Z., Application of a hydroxyl-radical-based disinfection system for ballast water, *Chemosphere* (2018), doi: 10.1016/j.chemosphere.2018.06.010.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

1 Application of a hydroxyl-radical-based disinfection system for ballast
2 water

3 Mindong Bai ^{a,1,*}, Yiping Tian ^{b,1}, Yixuan Yu ^b, Qilin Zheng ^a, Xiaofang Zhang ^b, Wu Zheng ^a,
4 and Zhitao Zhang ^{a,*}

5 ^a Fujian Collaborative Innovation Center for Exploitation and Utilization of Marine Biological Resources, Key
6 Laboratory of Education Ministry for Coastal and Wetland Ecosystems, College of Environment and Ecology,
7 Xiamen University, Xiamen, Fujian 361005, China.

8 ^b Environmental Engineering Institute, School of Science, Dalian Maritime University, Dalian, Liaoning 116026,
9 China.

10 * Corresponding author.

11 *E-mail:* mindong-bai@163.com (M. Bai); newzhangzhitao@163.com (Z. Zhang).

12 ¹ M. Bai and Y. Tian are co-first authors of this manuscript.

13 **ABSTRACT:**

14 A hydroxyl radical ($\bullet\text{OH}$) ballast water treatment system (BWTS) was developed and applied
15 to inactivate entrained organisms in a 10,000-ton oceanic ship, where $\bullet\text{OH}$ was produced by a
16 strong ionization discharge combined with a water jet cavitation effect. The calculated $\bullet\text{OH}$
17 generation rate was $1373.4 \mu\text{M min}^{-1}$ in ballast water, which is much higher than that in other
18 advanced oxidative processes such as photocatalysis. As a result, non-indigenous red tide
19 algae were inactivated to meet the ballast water discharge standards ($< 10 \text{ cells mL}^{-1}$) of the
20 International Maritime Organization. The ratio of variable fluorescence to maximum
21 fluorescence (F_v/F_m) for algal chlorophyll rapidly decreased to zero within a contact time of
22 only 6 s, indicating complete inactivation of algae. Observation under a scanning electron
23 microscope showed no cellular materials were released by algal cells upon $\bullet\text{OH}$ inactivation. A
24 risk assessment of the $\bullet\text{OH}$ treatment system was conducted, and the ratios of predicted
25 environmental concentrations to predicted no effect concentrations of all detected disinfection
26 byproducts were less than 1, even at a worst-case oxidant concentration of 2.41 mg L^{-1} . Ship

Download English Version:

<https://daneshyari.com/en/article/8850809>

Download Persian Version:

<https://daneshyari.com/article/8850809>

[Daneshyari.com](https://daneshyari.com)