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Comment on "Inhibiting the regeneration of *N*-nitrosodimethylamine in drinking water by UV photolysis combined with ozonation" by B. Xu, Z. Chen, F. Qi, J. Ma, F. Wu [J. Hazard. Mater. 168 (2009) 108–114]

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Recently, Xu et al. studied the degradation of *N*-nitrosodimethylamine (NDMA) by UV photolysis combined with ozonation [1]. However, as an interested reader of their article, I would like to raise my doubts on their research topic, experimental design and interpretation of data. Comments on several issues are presented in the following paragraphs.

(1) Their research topic is confusing. In the commented article, UV or UV/O_3 system was employed to generate NDMA precursors from NDMA, and then chlorination was used to regenerate NDMA from the precursors. The author of the comment therefore question how water treatment operators would like to create NDMA precursors through degrading NDMA by expensive UV or UV/O_3 unit and then regenerate NDMA by chlorination of the precursors. Hence, as a reader, I do not see any contributions of this study to real case. In many cases, NDMA is formed during chlorination of secondary wastewaters and chloramination of surface waters [2–4].
(2) Dimethylamine (DMA) and nitrite (NO_2^-) are the precursors for generating NDMA in the commented work. However, several studies have indicated that DMA concentrations in surface water or secondary municipal wastewaters are not high enough to generate NDMA [5,6]. DMA is not a predominante NDMA precursor [7], so why did the authors of the article in question still use it as NDMA precursor?
(3) During water or wastewater treatment, NDMA is produced in a very low level, say ppt level [2,8]. Nevertheless, the authors conducted their research on quite high concentration of NDMA (Figs. 3 and 4), ppm level. All living organisms may be killed in water containing NDMA in ppm level. Similarly, the concentrations of NDMA precursors, like NO_2^-, are also too high for surface water (the article focuses on drinking water as shown by its topic). NO_2^- can be readily oxidized to nitrate (NO_3^-). The NO_3^- concentration in surface water is only around 0.5 mg/L. Many natural waters are open system with respect to oxygen, so NO_2^- can hardly reach the level appeared in the commented article (NO_2^- is also a potent toxin). Therefore, their findings have no application in practice.
(4) NDMA is a semivolatile organic chemical with faint characteristic odor [9]. US EPA has identified that the maximum admissible concentration (MAC) of NDMA in drinking water is 0.7 ng/L associated with a theoretical 10^{-6} lifetime risk of cancer from NDMA exposures [10]. So how did the authors of the commented article prevent fainting when prepared a 0.1 mM (~7.4 mg/L, 10^7 times larger than the MAC level) NDMA sample or took samples during experiment?
(5) Even though one may bear above shortcomings, I also question the toxicity of byproducts of UV/O_3 on NDMA. DMA can be oxidized to formic acid which is a toxic substance [11]. Furthermore, bromide is generally present in surface water; O_3 can also oxidize bromide to bromate, another highly toxic substance. Although NDMA formation may be inhibited by UV/O_3, yet new problems emerge. Obviously, the authors of the commented paper failed to consider this point; no cited or experimentally obtained toxicity data are shown in this paper.
(6) Fig. 5 is important for the commented article. However, there are two confusing points in Fig. 5. As shown, in comparison with other dosages, the lowest Cl_2 dosage (1 mg/L) generated the highest amount of NDMA, while 5 mg/L Cl_2 produced lowest level of NDMA. But how, in view that Cl_2 is involved in NDMA generation (Section 3.2)? Is that the experimental error? In addition, the authors use NDMA to generate DMA by UV and

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UV/O_3. Then chlorination was performed on DMA to regenerate NDMA (Section 2.2). But is there any remaining NDMA after UV and UV/O_3 processes? The authors adopted high concentration of NDMA during UV and UV/O_3 processes (ppm level). Although the UV process may remove 99% of NDMA, yet very small amount of residual NDMA can cause considerable error during quantifying NDMA regeneration (ppb level), Ref. [12] details the process of NDMA formation during chlorination and should be useful for the authors.

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