

***Interactive comment on “Removal of radio
N-nitrosodimethylamine (NDMA) from drinking
water by coagulation and Powdered Activated
Carbon (PAC) adsorption” by J. Chung et al.***

J. Chung

jin-wook.chung@samsung.com

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Dear referees and editors,

This response address revisions to the manuscript DWES 2009-5 and The manuscript has been modified to incorporate all the comments provided by the reviewer(s). Attached is a list of authors's response for specific reviewer comments and final manuscript modified to incorporate all the comments provided by the reviewer(s) as supplementary material.

Responses to Comments for Referee #1

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This paper describes a removal of low level of NDMA in raw drinking water, and shows how its efficiency can be improved by a contact time and PAC dosage under the given combination of filtration processes with PAC. While the paper makes a new and valuable insight to membrane scientists and engineers, lots of logical and grammatical errors throughout the manuscript may hinder the research merits. So, authors had better address the following issues at a minimum, before the paper is considered for publication.

1. Q: In abstract, authors consider international readers to have a broad sense. Think about why your manuscript is important and what your recommendation is in this manuscript. Most well-rounded papers include these issues in abstract: importance of your manuscript, objectives of this study, methods employed, main conclusions reached, and implication or recommendation. Also some errors should be corrected: for instance, provide full name in a first appearance, check the passive voice, and provide better expression in the last two sentences. A: Thank you for the valuable suggestions. We have revised Abstract as suggested. 'However, only limited studies have been examined to evaluate the potential removal of NDMA by numerous water treatment technologies within a realistic range (i.e., sub ug/L) of NDMA levels in natural water due to analytical availability. The results show that coagulation and biosorption may not be appropriate mechanisms to remove NDMA (i.e., hydrophilic based on its low octanol-water partitioning coefficient, Log Kow = 0.57). However, relatively high removal of NDMA (approximately 50%) was obtained by PAC at high PAC dosages and longer contact times.'

2. Q: In contrast to an abstract, author(s) provides a tedious and prolonged talk to reach their objectives of this study in introduction section. In introduction section, you should not only show your expert knowledge on this specific area, but provide a concise and well-turned expression. Please better clarify the objective(s) of this and the results of other researches. A: We have revised the text on page 5 to clarify them. 'only limited research on NDMA removal using conventional and/or advanced water treatment

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technologies has been conducted at low NDMA initial concentrations. Therefore, in this study, several water treatment technologies including coagulation and powdered activated carbon (PAC) adsorption were tested to evaluate the potential of ¹⁴C-labeled NDMA removal at extremely low NDMA initial concentrations ($C_0 = 100$ ng/L). In addition, biosorption experiments were conducted using conventional activated sludge to investigate NDMA removal. For this study, a simple analytical technique for rapid determination of a ¹⁴C-labeled NDMA was developed using a liquid scintillation counter. We have also demonstrated role of scintillation counting for process studies with emerging contaminant available from pharmacological studies.'

3. Q: Materials and methods section also have lots of grammatical errors, requiring fairly minor revision. Check which one is correct: RDW "collected from a local water treatment plant (WTP)" or "collected from a local wastewater treatment plant". Provide full name instead of "alum". Remove a parenthesis, "[]" A: We have revised the manuscript for those grammatical errors by having a native English speaker review this manuscript. The RDW was collected from a local WTP. "alum" full name has been provided in the text on page 7.

4. Q: Even though authors did not provide all detailed (or full) discussion on the obtained results to the readers, they should often extend their reasonable idea as far as they could go. Of course, this may depend on style of international journals, but current manuscript appears to have too narrow summary regarding a discussion of the results. A: Thank you for the suggestions. We have revised slightly the text as suggested on pages 11 and 12.

5. Q: In many papers, author(s) often provides a list of summaries in conclusion section. So, reviewer recommends author(s) to summarize their results based on sub-heading in results section. Current conclusion, in a reviewer's opinion, also conveys too slim idea to the readers, and in particular the last two sentences in this section should be corrected. A: We have revised the manuscript as suggested on page 13.

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6. Q: Figure legends in one or between figures should be generally identical (please unify their font and size). In particular, the legends in Figure 5 should be corrected: MF with out PAC and MF (UF) with out PAC Finally, a reviewer recommends author(s) to correct grammatical errors of the manuscript with native English speakers. If author(s) takes into account all the above factors, the article can be accepted for publication in the Journal. A: We have revised those as suggested. 'In addition, it was observed that the removal of NDMA by biosorption was insignificant at the limited conditions, indicating that biosorption may be an ineffective mechanism for removing hydrophilic NDMA even at an extremely low initial concentration (100 ng/L).'

Responses to Comments for Referee #2

The study by Chung et al. investigated the removal of NDMA by PAC, coagulation, and biosorption. For this study, a radio-labeled NDMA was used at a very low initial concentration. I found that this study has provided very careful/detailed NDMA determination procedures by using a liquid scintillation counter. This information is useful for other researchers who will use radio-labeled compounds, since many researchers often follow previous detection methods without developing their own detection procedures in radio-labeled compound use. In addition, their findings are quite interesting, especially with PAC although the NDMA removal is not significant as expected due to its low hydrophobicity. I believe that the results are still valid in NDMA water treatment, since not many previous studies have been conducted for NDMA removal by coagulation, PAC, and biosorption, especially at very low concentrations (\sim ng/L). This manuscript can be published with a few minor revisions:

1. Q: Abstract- Authors have focused on NDMA detection method development with a relatively small portion of NDMA removal. Abstract can be stronger by expanding NDMA removal part. A: Thank you for the comment. We have revised Abstract as suggested.

2. Q: Conclusion - 'Although insignificant NDMA removal results were obtained in this

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study, these results verify : : : : NDMA even at an extremely : : : ' does make sense. This sentence needs be rewritten. A: We have revised the manuscript. 'In addition, it was observed that the removal of NDMA by biosorption was insignificant at the limited conditions, indicating that biosorption may be an ineffective mechanism for removing hydrophilic NDMA even at an extremely low initial concentration (100 ng/L).'

3. Q: Figure 7- I see this figure is not consistent with the others based on its font and font size. Make all consistent. A: We have revised the figure as suggested.

4. Q: This manuscript can be improved by English speakers' review – strongly recommended. A: The manuscript was reviewed by a native English speaker.

Please also note the Supplement to this comment.

Interactive comment on Drink. Water Eng. Sci. Discuss., 2, 79, 2009.