

Supplementary Materials: Removal of Algae, and Taste and Odor Compounds by Combination of Plant-Mineral Composite (PMC) Coagulant with UV-AOPs: Laboratory and Pilot Scale Studies

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Section S1. Measurement of OH radical scavenging factor

Application of the $R_{OH,UV}$ concept for measuring the OH radical scavenging rate has been recognized as a more reliable method for $\bullet OH$ water demand measurement than other methods based on theoretical calculations [1]. The degradation of a well-known chemical probe compound via direct photolysis and $\bullet OH$ reaction parameters were used to determine the $R_{OH,UV}$ value (Eq. S1). In this study, para-chlorobenzoic acid (*p*CBA) was used as a probe compound for measuring the scavenging factor and this method was applied in this work to determine the scavenging factor.

$$R_{OH,UV} = \frac{\int_0^t [OH] dt}{E_0 \times t} = \frac{k_T'^{app} - k_d'^{app}}{k_{OH,pCBA}^{app}} \quad (S1)$$

where $k_d'^{app}$ is the fluence-based apparent rate constant for direct UV photolysis, $k_T'^{app}$ is the fluence-based apparent rate constant when H_2O_2 is added, and $k_{OH,pCBA}^{app}$ is the apparent rate constant of *p*CBA solution decolorization ($5 \times 10^9 M^{-1} s^{-1}$) [1].

The $\bullet OH$ water background demand can be calculated using the measured $R_{OH,UV}$ values with Eq. (S2).

$$\sum k_{s,OH}[S]_i = \left(k_{H_2O_2,OH} \times \frac{m}{b} \right) - k_{OH,pCBA}^{app} [pCBA] \quad (S2)$$

where $\sum k_{s,OH}[S]_i$ is the $\bullet OH$ water demand (s^{-1}); $k_{H_2O_2,OH}$ is the second-order rate constant for the $\bullet OH$ reaction with H_2O_2 ($2.7 \times 10^7 M^{-1} s^{-1}$) [2, 3]; m and b are the slope and the intercept of the plot of $1/R_{OH,UV}$ vs. $1/[H_2O_2]_0$ (Fig. S1), respectively; and $[pCBA]$ is the initial concentration of *p*CBA.

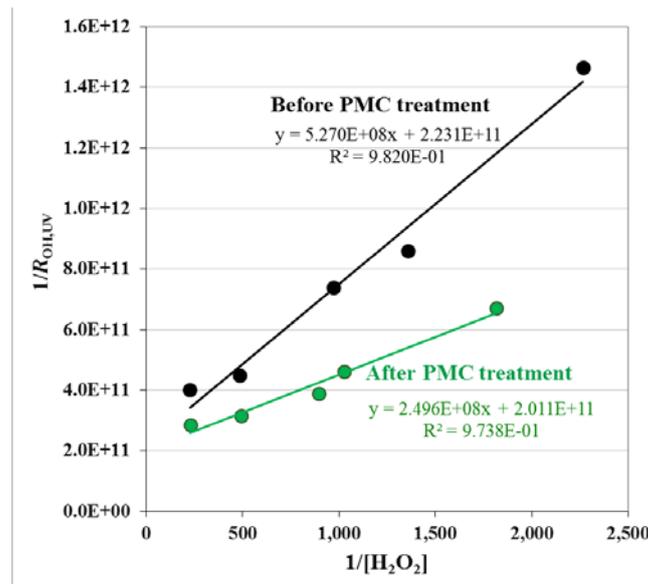


Figure S1. Determination of scavenging factor for the water sample before and after PMC treatment used in collimated beam work: $R_{OH,UV}$ variation with the initial H_2O_2 concentration;

References

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