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1 **Investigation of Ozone and Peroxone Impacts on Natural Organic Matter Character and**
2 **Biofiltration Performance using Fluorescence Spectroscopy**

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5 **Abstract**

6 Impacts of ozonation alone as well as an advanced oxidation process of ozone plus
7 hydrogen peroxide ($\text{H}_2\text{O}_2 + \text{O}_3$) on organic matter prior to and following biofiltration were
8 studied at pilot-scale. Three biofilters were operated in parallel to assess the effects of varying
9 pre-treatment types and dosages. Conventionally treated water
10 (coagulation/flocculation/sedimentation) was fed to one control biofilter, while the remaining
11 two received water with varying applied doses of O_3 or $\text{H}_2\text{O}_2 + \text{O}_3$. Changes in organic matter
12 were characterized using parallel factors analysis (PARAFAC) and fluorescence peak shifts.
13 Intensities of all PARAFAC components were reduced by pre-oxidation, however, individual
14 humic-like components were observed to be impacted to varying degrees upon exposure to O_3 or
15 $\text{H}_2\text{O}_2 + \text{O}_3$. While the control biofilter uniformly reduced fluorescence of all PARAFAC
16 components, three of the humic-like components were produced by biofiltration only when pre-
17 oxidation was applied. A fluorescence red shift, which occurred with the application of O_3 or
18 $\text{H}_2\text{O}_2 + \text{O}_3$, was attributed to a relative increase in carbonyl-containing components based on
19 previously reported results. A subsequent blue shift in fluorescence caused by biofiltration
20 which received pre-oxidized water indicated that biological treatment readily utilized organics

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