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A Pilot-Scale Investigation of Disinfection By-Product Precursors and Trace Organic Removal Mechanisms in Ozone-Biologically Activated Carbon Treatment for Potable Reuse

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Abstract: Although granular activated carbon (GAC) has been broadly applied in ozone-biologically activated carbon filtration (O_3/BAC) systems for potable reuse of municipal wastewater, the mechanisms of various pollutant removal remain largely unknown as the regenerated GAC develops microbial populations resulting in biofiltration but loses significant adsorption capacity as it becomes spent GAC. Therefore, pilot-scale parallel performance comparisons of spent and regenerated GAC, along with a range of pre-oxidant ozone doses, were used to shed light on the mechanisms responsible for the removal of various types of treatment byproduct precursors and trace organic compounds. It was confirmed from this pilot-study that ozone alone can effectively degrade chlorinated THM and HAA precursors, chloramine-reactive NDMA precursors, and 29 PPCPs. In contrast, biodegradation by microbial population on spent or regenerated GAC can remove NDMA and 22 PPCPs, while the adsorption by regenerated GAC can remove chlorinated THM and HAA precursors, PFAS, flame retardants, and 27 PPCPs. The results of this pilot study are intended to provide those interested in potable reuse with an