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## ABSTRACT

## Interactions of the removal of organic odorant and inorganic odorants in biotrickling filters

Dezhao Liu*, Xianwang Kong, Shihao Ying, Zhen Cai

Key Laboratory of Equipment and Informatization in Environment Controlled Agriculture, Ministry of Agriculture and Rural Affairs, College of Biosystems Engineering and Food Science, Zhejiang University, Hangzhou 310058, China

Summary
Inorganic odorants, including ammonia and hydrogen sulfide, are common odorants emitted from e.g. intensive livestock farms and many other sources. Biotrickling filter (BTF) is widely used for the reduction of these inorganic odorants especially when facing high flow rate and low concentration of the odorants. However, studies from recent years revealed that nitrous oxide was typically found in the BTFs treating odor containing ammonia. This might be linked to the processes of nitrification and denitrification in the reactors and organic odorants could play a role during these processes. Til now, little is known for the interactions between the removal of organic odorants and inorganic odorants (ammonia and hydrogen sulfide) regarding the nitrous oxide production and control in BTFs. In this study, two lab-scale BTFs (organic odorant-BTF vs. control BTF) packed with polyurethane foam were applied to explore the effect of p-cresol (representative VOC odorant; 400 ppbv ~ 4 ppmv) on the removal of hydrogen sulfide (250 ppbv ~ 1.5 ppmv) and ammonia (4~35 ppmv). The effect of p-cresol as a potential organic carbon source on the formation of nitrous oxide was also explored. The results showed that the overall removal rate of hydrogen sulfide in the organic odorant-BTF was generally higher than that in the control BTF. The removal rate of ammonia in both BTFs during stable operation period was above 95%. The removal rate of p-cresol in the organic odorant-BTF was higher than 99%. Meanwhile, the conversion rate of nitrous oxide in the control BTF was about 1.3%, and that in the organic odorant-BTF was about 1.9%. The conversion rate from ammonia to nitrous oxide in the organic odorant-BTF was significantly higher in some time periods, suggesting that p-cresol as an organic carbon source would increase the generation of nitrous oxide. The results of high-throughput sequencing indicated that more denitrification reactions occurred in the organic odorant-BTF compared to the control BTF.

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