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ABSTRACT

AMMONIA REDUCTION AND RECOVERY THROUGH WET SCRUBBER/BIOTRICKLING FILTER COMBINED WITH MICROALGAE SYSTEM

Runyu Zheng, Zhen Cai, Xianwang Kong, Musa Abubakar Tadda, Dezhao Liu*

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
Ammonia is a typical odorant, which is meanwhile an important pollutant to the atmosphere. Especially, livestock is largely responsible for the emission of ammonia worldwide. Usually, ammonia can be efficiently reduced through acid-base reaction (using sulfuric acid), and the obtained liquid containing ammonium sulphate can be reused in field application. However, this method is currently not widely applied in China, as sulfuric acid usage is strictly restrained. Biological air filters were often applied as an efficient solution for simultaneous removal of ammonia and other odorants, with however careful and regular operation optimization needed by professionals. In China, the wet scrubber is typically applied as a simple and cheap solution for removing ammonia (and little of other odorants) from livestock, causing however extra cost for wastewater treatment. In this study, a comparison evalutaion was conducted using wet scrubber/biotrickling filter and microalgae system for the simultaneous reduction of ammonia and the recovery of resource. The reservoir for the wet scrubber or biotricking filter system was used for the cultivation of microalgae to avoid using more facilities. A membrane filter was used to filter and keep the microalgae in the reservoir for the convenience of microalgae harvest. Chlorella sp. was chosen as the microalgae for cultivation in both systems since it was proved to be efficient for degradation of ammonia and nitrate. The results showed that wet scrubber-microalgae system (WSM) can better remove ammonia from the air (50~70% removal) as compared to the wet scrubber system without microalgae (WS; control; 25~40% removal). Microalgae biomass was observed to be well cultivated and can easily be harvested from the system. For the Biotrickling filter-Microalgae system, the microalgae cultivitation efficiency was observed to be less efficient but still sufficient for the removing of ammonia from the system. This simple wet scrubber/biotrickling filter combined with microalgae system demonstrated two reasonable solutions for simultaneously reducing ammonia odorant emission and recovery of resource.

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