

VUV photon induced photochemical modification of ammonia nitrogen for improvement of fertilizer efficiency

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Nitrogen is an essential nutrient for plant growth, with ammonia nitrogen and nitrate nitrogen serving as primary sources. Upon application to soil, these nitrogen forms are converted into nitrate nitrogen through microbial nitrification. However, the recent sharp increase in the cost of fertilizer materials, coupled with a growing emphasis on organic farming, has heightened the demand for technologies that improve the conversion efficiency of livestock waste into fertilizers. Livestock waste, comprising a mixture of feces and urine, is typically discharged as dairy slurry with a moisture content exceeding 87%, rendering it unsuitable for direct composting.

Currently, methane fermentation of dairy slurry is increasingly being adopted, with the generated methane utilized as an energy source. Nevertheless, the digested liquid, which constitutes the treated effluent, contains high concentrations of ammonium ions and often fails to meet the effluent standards stipulated by the Water Pollution Control Law, thus complicating its direct discharge. Furthermore, ammonia volatilization from the digested liquid not only generates odor but also diminishes fertilizer efficiency by dispersing essential nutrients.

Therefore, in this study, we developed ammonia modification system with Xe₂ excimer lamp to try to modify the ammonia solution, as shown in Fig.1. In the presentation, the efficiency of ammonia nitrogen reforming in relation to the amount of UV irradiation will be discussed.

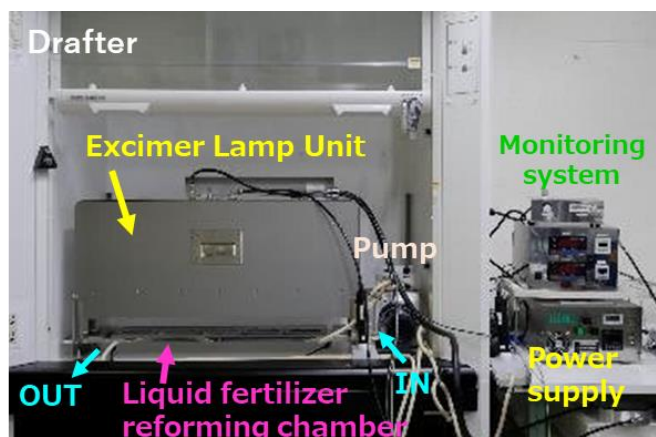


Fig.1 ammonia modification system with Xe₂ excimer lamp