

Influence of natural zeolite and nitrification inhibitor on organics degradation and nitrogen transformation during sludge composting

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Abstract Sludge composting is one of the most widely used treatments for sewage sludge resource utilization. Natural zeolite and nitrification inhibitor (NI) are widely used during composting and land application for nitrogen conservation, respectively. Three composting reactors (A—the control, B—natural zeolite addition, and C—3,4-dimethylpyrazole phosphate (DMPP) addition) were established to investigate the influence of NI and natural zeolite addition on organics degradation and nitrogen transformation during sludge composting conducted at the lab scale. The results showed that, in comparison with the control, natural zeolite addition accelerated organics degradation and the maturity of sludge compost was higher, while the DMPP addition slowed down the degradation of organic matters. Meanwhile, the nitrogen transformation functional genes including those responses for nitrification (*amoA* and *nxrA*) and denitrification (*narG*, *nirS*, *nirK*, and *nosZ*) were quantified through quantitative PCR (qPCR) to investigate the effects of natural zeolites

and DMPP addition on nitrogen transformation. Although no significant difference in the abundance of nitrogen transformation functional genes was observed between treatments, addition of both natural zeolite and DMPP increases the final total nitrogen content by 48.6% and 23.1%, respectively. The ability of natural zeolite for nitrogen conservation was due to the absorption of NH₃ by compost, and nitrogen conservation by DMPP was achieved by the source reduction of denitrification. Besides, it was assumed that the addition of natural zeolite and DMPP may affect the activity of these genes instead of the abundance.

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