



Effect of heterotrophic activities on nitrous oxide emission during nitrification under different aeration rates

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ABSTRACT

Nitrous oxide (N_2O), a greenhouse gas, can be released from both nitrification and denitrification during wastewater treatment. In this study, N_2O emission under three aerobic conditions (aeration rates of 100, 250, and 500 ml/min, respectively) were examined, one with only endogenous heterotrophic activities, one with heterotrophic activities using internal stored organic carbon (polyhydroxybutyrate, PHB), and the other with heterotrophic activities using external organic carbon (acetate). Under the condition with PHB as the organic carbon, the released N_2O -N to the produced oxidized nitrogen (NO_x -N) was 10.0% at 100 ml/min, 3.6% at 250 ml/min, and 0.6% at 500 ml/min. Under the condition with acetate as the organic carbon, the released N_2O -N to the produced NO_x -N was 14.5% at 100 ml/min, 4.1% at 250 ml/min, and 0.7% at 500 ml/min. Under the condition without organic carbon, the released N_2O -N to the produced NO_x -N was 0.18% at 100 ml/min, 0.20% at 250 ml/min, and 0.41% at 500 ml/min. These results showed that (i) heterotrophic activities affected N_2O emission during nitrification significantly; (ii) there was no significant difference in N_2O emission during nitrification affected by heterotrophic activities using internal or external organic carbon; and (iii) a high aeration rate with a high dissolved oxygen concentration reduced N_2O emission significantly under aerobic conditions.

Keywords: Nitrous oxide; Nitrification; Denitrification; Heterotrophic activity; Aeration rate

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