

12th Water Environment Seminar

**New Biological Nitrogen Removal Processes in Wastewater:
Experimental Study of De-Ammonification Process**



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Ookayama Campus, Tokyo Institute of Technology

Abstract: Nitrogen from wastewaters is a pollutant source of water pollution. Nitrogen significantly enhances eutrophication of freshwater, lakes, estuary, etc. For this reason, nitrogen should be removed before it is discharged into the environment. The worldwide standard for biological nitrogen removal (BNR) is the conventional nitrification-denitrification processes. Nitrification oxidizes ammonium (NH_4^+) to nitrite (NO_2^-) to nitrate (NO_3^-) followed by denitrification which converts NO_3^- to NO_2^- to nitric oxide (NO) to nitrous oxide (N_2O) to nitrogen gas (N_2). However, the COD/N ratio in wastewater influent is a very important factor in the conventional nitrification-denitrification processes. For this reason, wastewater with high NH_4^+ but low carbon content, such as effluents from anaerobic digester of piggery farm, municipal wastewaters, slaughterhouse, leachate, potato processing industry, and supernatant from anaerobic digester from BNR wastewater treatment plant are significantly difficult to treat by the conventional nitrification-denitrification processes. Furthermore, high cost and operation problems would be incurred in these types of wastewater if the conventional BNR is still used to implement. Another alternative approach of BNR, the processes of partial nitrification- De-Ammonification or Anaerobic AMMonium OXidation (Anammox) (NO_2^- to N_2 gas using NH_4^+ as electron donor and NO_2^- as electron acceptor) have been developed and promoted. These processes have the following advantages over conventional biological nitrogen removal process: save energy, reduces carbon requirements, and decreases in biomass yield produced. However, these processes are developing and challenging for biological nitrogen removal in the future.

Keywords: New Biological Nitrogen Removal, De-ammonification, Anammox

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