Viet Nam National University
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INFORMATION OF THE DISSERTATION

Dissertation's title:	STUDY ON APPLICATION OF PARTIAL NITRITATION-ANAMMOX TECHNOLOGY FOR TREATING NITROGEN IN OLD LEACHATE TREATMENT
Major:	Environmental Engineering
Major code:	62520320
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Objective of dissertation

- Evaluation of the efficiency of converting ammonium to nitrite in the old leachate of the partial nitritation process using SBR technology to meet the Anammox process behind. From there, determining the kinetic parameters of bacteria AOB, investigating the effect of free ammonia (FA- Free Ammonia) on the partial nitritation process on old leachate using respirometer as well as investigated the COD removal efficiency of the process by TbOD method.
- Research on application of Anammox process to treat nitrogen in old leachate at high concentration and load using internal circulation model (IC- Internal Circulation).

Contribution of dissertation

In this research, semi-nitritation – Anammox proccess was used to treat nitrogen in old landfill leachate with experiment include: a lab-scale concentrated sludge experiment by sequencing batch reactor model (PN-SBR), a effective evaluation test for PN-SBR model and a effective evaluation test for AIC model. This study also determine dynamic

parameter AOB, actived organism Anammox, and the population of organism in AIC model.

A lab-scale concentrated sludge experiment by PN-SBR was conducted in a SBR tank with volume of 66,5 L and leachate concentration diluted with water in ratios of 13%, 27%, 41%, 53% and 100%, respectively. In the stable practice period with 100% raw landfill leachate, the ratio of NO_2^--N/NH_4^+-N was achieved 1.0 in flux, which was small than the stochiometric ratio of NO_2^--N/NH_4^+-N of 1.32.

A effective evaluation test for PN-SBR model was conducted in a SBR tank with volume of 190,0 L containing the raw landfill leachate absolutely. As the rusult, the ratio NO_2^--N/NH_4^+-N was range of 1.0-1.32 in flux. The output NO_3^--N concentration was always below 20 mgN/L. The highest FA concentration is of 506 mg NH_3-N/l in 26th of hour of the cycle of 73 hour/batch. Even though old land fill leachate mainly contained refractory COD, COD removal efficiency achieved about 11%. The OUR tests show that the maximum growth rate mmax, Ko, Ks and yield coefficient YX/N of AOB were 0.12/day, 1.35 mg O2/l, 53 mgNH_4^+-N/L and 0.26 mgVSS/mg NH_4^+-N, respectively.

A effective evaluation test for AIC model with landfill leachate was operated with pre-treated leachate from PNSBR reactor using a high nitrogen loading rate ranging from 2 to 10 kgN/m^3/day. High rate removal of nitrogen (9.52 ± 1.11 kgN/m^3/day) was observed at an influent nitrogen concentration of 1500 mgN/L. The specific ANAMMOX activity was found to be 0.598 ± 0.026gN_2-N/gVSS. Analysis of ANAMMOX granules suggested that 0.5–1.0 mm size granular sludge was the dominant group. The results of DNA analysis revealed that Candidatus Kueneniastuttgartiensis was the dominant species (37.45%) in the IC reactor, whereas other species like uncultured Bacteroidetes bacterium only constituted 5.37% in the system, but they were still responsible for removing recalcitrant organic matter.