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Abstract

This study aimed to evaluate the performance of a high rate nitrogen removal lab-scale ANAMMOX reactor, namely Internal Circulation (IC) reactor, for old landfill leachate treatment. The reactor was operated with pre-treated leachate from a pilot Partial Nitritation Reactor (PNR) using a high nitrogen loading rate ranging from 2 to 10 kg N m^{-3} d^{-1}. High rate removal of nitrogen (9.52 ± 1.11 kg N m^{-3} d^{-1}) was observed at an influent nitrogen concentration of 1,500 mg N L^{-1}. The specific ANAMMOX activity was found to be 0.598 ± 0.026 gN_2-N $gVSS^{-1}$ d^{-1}. 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.

Keywords: Leachate, IC; ANAMMOX, Nitrogen removal and granular sludge