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Landfill-leachate treatment by simultaneous partial nitrification, anammox and denitrification (SNAD) process

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ABSTRACT

Simultaneous partial nitrification, anammox and denitrification (SNAD) process was developed in a sequential batch reactor (SBR), and the application of SNAD process for landfill-leachate treatment was investigated. The SNAD process was developed from the biomass of a full-scale landfill-leachate treatment plant. After the adaptation of biomass, the SBR was operated in four stages (I–IV) with varying nitrogen loading rates (NLRs), i.e. 118–280 mg-N/L/d, and organic loading rates (OLRs), i.e. 100–200 mg/L/d. The increase in the NLR has proportionately reduced the NH_4^+-N removal. However, the NO_2^--N concentration was close to zero and the NO_3^--N concentration was less than 36 mg/L in all the stages. A consistent chemical oxygen demand (COD) removal was observed in stages I to IV, which indicate that the SBR was not affected by the increase or decrease of the OLR. The total nitrogen removal in the SBR was mainly achieved by partial nitrification and anammox (69–88%) that was evaluated by a stoichiometric model. Moreover, the influence of NLR and OLR on the SNAD process was determined based on sensitivity index (SI). The SI values indicate that the SNAD process was highly affected by the influent NH_4^+-N compared to COD.

Keywords: Nitrification; Denitrification; Anammox; Sequential batch reactor; Landfill-leachate

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