

## Influence of two-stage aeration on short-course simultaneous nitrification and denitrification of aerobic granular sludge

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Received 14 September 2017; Accepted 23 March 2018

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### ABSTRACT

The two-stage aeration operational mode was used in an aerobic granular sludge (AGS) sequencing batch reactor, under different high and low aeration time distribution. Obtained results showed that the introduction of the low aeration stage provided a good denitrification environment, alleviating the competition for nutrients between heterotrophic aerobic microorganisms. This method had quickly realized the process of short range simultaneous nitrification and denitrification (SSND), the total nitrogen removal rate increased from 40% to about 75%. The ratio of PN/PS rose from 1.27 to the highest value of 1.81, which improved the mass transfer efficiency in a single particle and enhanced the stability of AGS. Furthermore, it was known from the results of confocal laser scanning microscope (CLSM) and high-throughput pyrosequencing and phylogenetic assignment that the nitrite-oxidizing bacteria (NOB) were not completely washed, but rather stored in dead cells, in the inner layer of AGS. Consequently, this method could save the energy needed for aeration and improve the nitrogen removal performance and stability of AGS.

*Keywords:* Two-stage aeration; Short-range simultaneous nitrification and denitrification; Microbiological analysis; Confocal laser scanning microscope

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