



Denitrification of synthetic wastewater containing high nitrate concentration

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Introduction

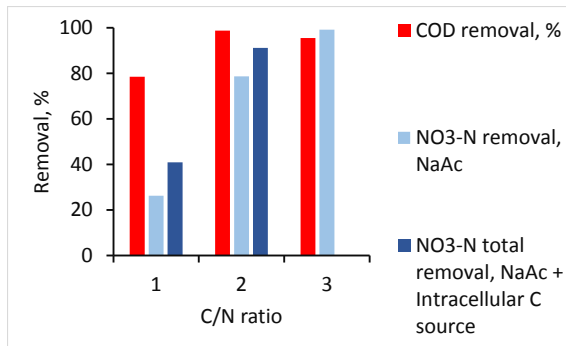
Some industries produce wastewater highly loaded with nitrate, up to 1000 mg NO₃-N/L. The treatment of such wastewater is challenging due to possible intermediate products (nitrite) accumulation, which in turn, pose a serious inhibition for microorganisms in activated sludge. Also, wastewater containing high-strength nitrate requires long acclimatization period.

The different C/N ratios in the denitrification of synthetic wastewater containing 250±5 mg NO₃-N/L was studied.

Materials and Methods

- ✓ batch experiments at 250±5 mg NO₃-N/L
- ✓ C-source - sodium acetate (NaAc) at ratios C/N 1, 2 and 3
- ✓ working volume - 0.5 L
- ✓ magnetic stirrer
- ✓ activated sludge - from municipal wastewater treatment plant, it was previously acclimatized to high nitrate concentration
- ✓ analysis: mixed liquor suspended solids (MLSS), chemical oxygen demand (COD), NO₃-N and NO₂-N - according to Standard Methods
- ✓ pH value, dissolved oxygen (DO) concentration and temperature - pH meter (WTW 330i) and pH electrode (SenTix41), and DO meter (WTW Oxi3210) and oxygen electrode (DurOx)
- ✓ anoxic conditions (DO ≤ 0.3 mg DO/L), temperature 22±2 °C

Results



- The ratio C/N 3 ensured sufficient amount of organics for complete denitrification.
- Denitrification at ratios C/N 1 and 2 was performed at two denitrification rates, with acetate, and then, after acetate depletion, with intracellular C storage.
- The denitrification with intracellular storage was performed at lower denitrification rate.

Conclusions

- Denitrification of high nitrate wastewater could be performed with activated sludge previously acclimatized to high nitrate concentration for the development of suitable denitrifying community, and for the prevention of an inhibitory effect on the denitrifying bacteria.
- The ratio C/N 3 is required for complete denitrification and organics present at low concentration at the end of the experiment.