Inhibition of Encapsulated Nitrite Oxidizing Bacteria by Short-time Exposure to Hydroxylamine

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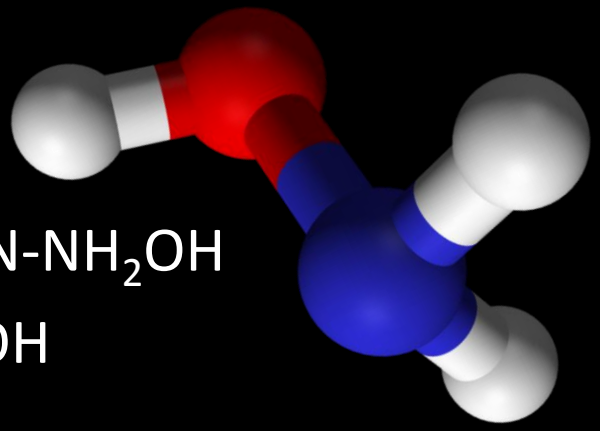
PRAGUE

Introduction

- Nitrification
  - Nitritation
    - AOB
  - Nitration
    - NOB
- Partial nitrification
  - Oxygen demand 25% lower
  - Decreased COD consumption

Introduction

- Nitration inhibition
  - Higher concentration of nitrification substrates, products and intermediates
  - Hydroxylamine
    - Suspended biomass: 0.42 mg/l N-NH_2OH
    - Biofilters: 2.5 – 5.0 mg/l N-NH_2OH

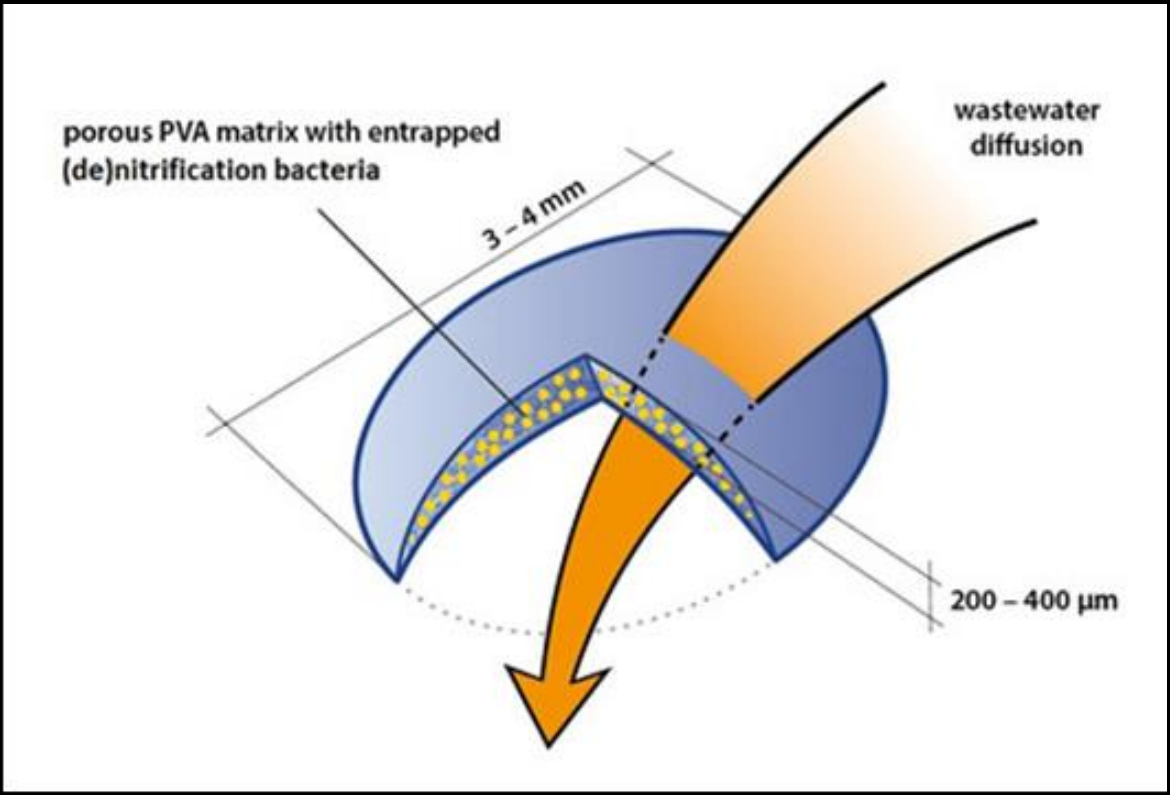


Introduction

- Immobilisation
  - Supports slowly growing MO
  - Encapsulation in PVA or PEG
    - Protection againts external conditions
    - Lower sensitivity on inhibitors presence, pH value or temperature changes

Materials and methods

- LentiKat's



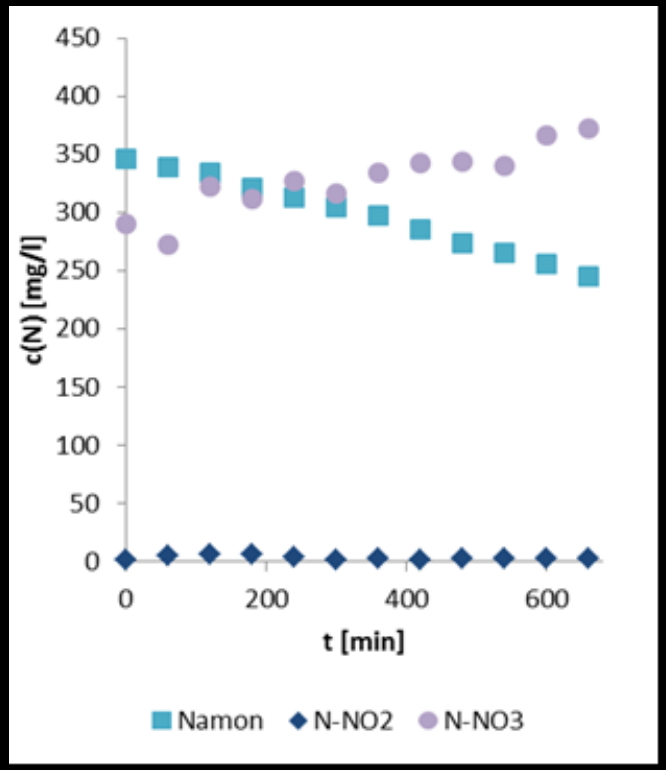
Materials and methods

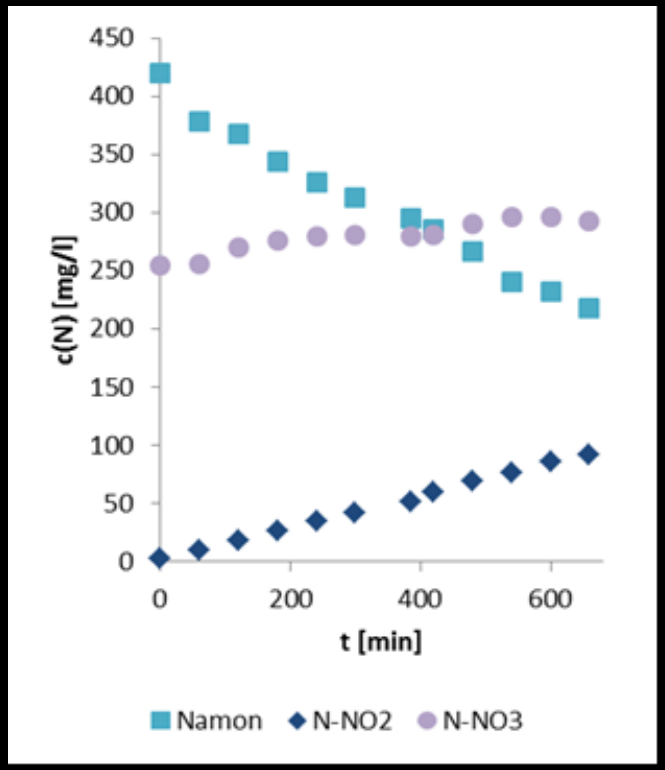
Materials and methods I (dose)

- SBR
- 50 g pellets
  - *Nitrosomonas europaea*, *Nitrobacter winogradskyi*
- 1 l diluted rejected water
- HRT 3.3 days
- DO > 4 mg/l, pH 7.0 – 7.3
- Initial N-NH_2OH concentration 10 – 200 mg/l

Results I (dose)

- $N\text{-}NH_2OH$ 0 mg/l (left) and 50 mg/l (right)





Materials and methods II (HRT)

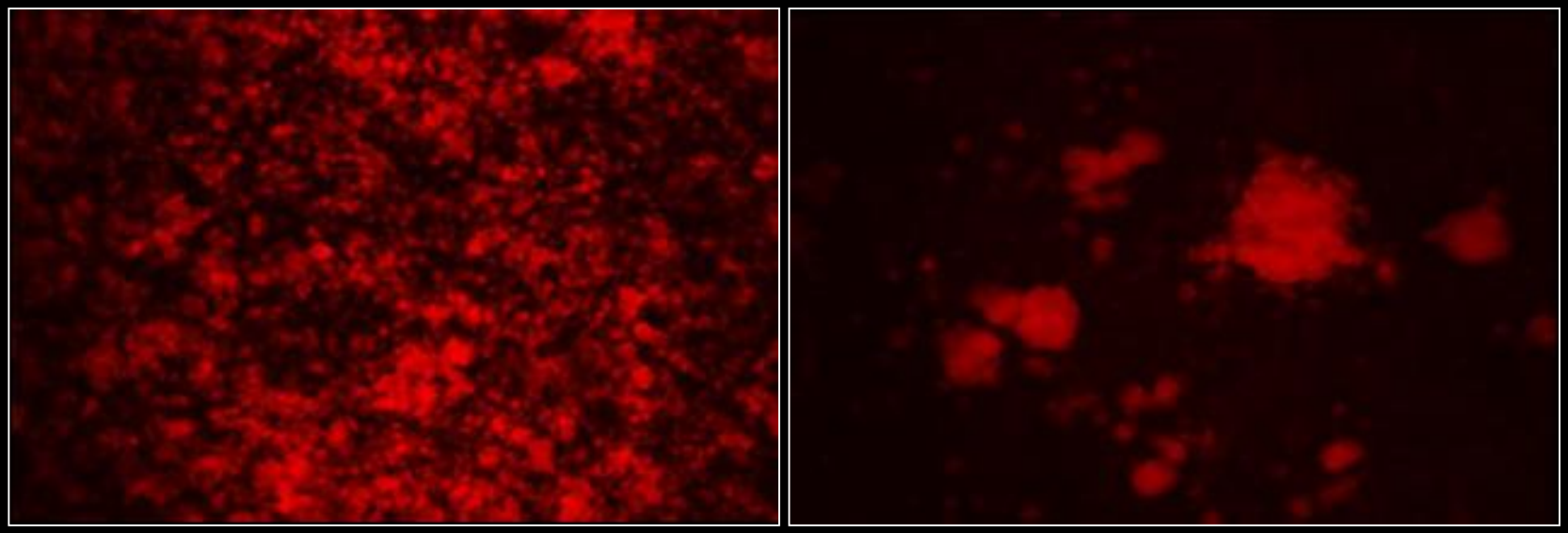
- SBR
- 100 g pellets
  - *Nitrosomonas europaea*, *Nitrobacter winogradskyi*
- 1.2 l diluted rejected water
- N_{amon} loading 200 mg/(l.d)
- DO > 4 mg/l, pH 7.2 ± 0.15
- Initial N-NH_2OH concentration 200 mg/l
- HRT 1 day and 3 days

Results II (HRT)

- 1-day HRT
  - $c(N\text{-}NO_2)_{MAX}$ = 150 mg/l
- 3-days HRT
  - $c(N\text{-}NO_2)_{MAX}$ = 500 mg/l

Results (FISH)

- AOB before (left) and after (right) inhibition



Conclusion

- Because of higher chemical resistance of bacteria which are immobilised in PVA pellets the N-NH_2OH concentration needed is higher than in the case of suspended biomass.
- Unfortunately, the N-NH_2OH concentration needed for full nitration inhibition has not been found.
- However, partial nitrification with immobilised biomass using nitration inhibition with hydroxylamine could be an appropriate method for nitrogen removal from water with high N_{amon} concentration.

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Thank

you

for

your

attention