

# Ammonium removal by nitrification in drinking water treatment

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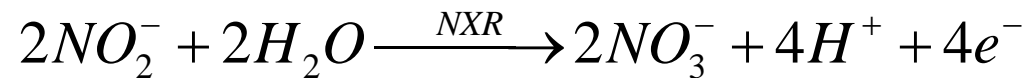
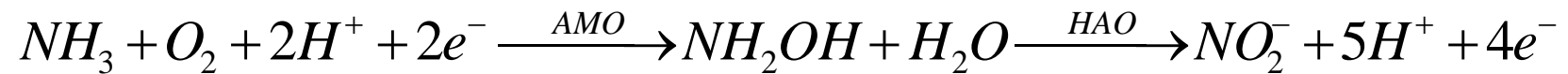
# Overview of the nitrifying organisms

- Ammonia-oxidizing *Archaea* (AOA)
- Ammonia-oxidizing bacteria (AOB): *Beta-*, *Gammaproteobacteria*
- Heterotrophic nitrifiers
- Anammox bacteria: *Planctomycetales*
- Nitrite-oxidizing bacteria (NOB)

# Important enzymes

- Ammonia monooxygenase (AMO), Cu-, Fe-dependent
- Hydroxylamine oxidoreductase (HAO) - heme P460
- Nitrite oxidoreductase (NXR) - iron-sulfur molybdoenzyme (*Nitrobacter winogradskyi*)

# The main biochemical mechanisms



# Factors affecting successful biological nitrogen removal

- Slow growth
- Dissolved oxygen
- Temperature
- pH
- Inorganic carbon
- Light

# Removal of nitrate

- Denitrification to  $N_2$
- Exogenous electron donor must be supplied

# Conclusions

- Nitrification in many cases appear to be an efficient and cost-effective method for ammonium removal.
- The choice of a suitable colonization medium to support fixed biomass is important.
- The control of relevant environmental factors is required.