Česká zemědělská univerzita v Praze
Fakulta agrobiologie, potravinových a přírodních zdrojů

DOKTORSKÝ STUDIJNÍ PROGRAM/ DOCTORAL STUDY PROGRAM

NÁVRH TÉMATU/PROPOSAL OF THEME

Studijní program/*Study Program*: **Special Agricultural Science**

Studijní obor/*Branch of Study*: **Exploitation and Protection of Natural Resources**

Katedra/*Department of*: **Agroenvironmental Chemistry and Plant Nutrition**

Školitel (včetně titulů), email/*Supervisor*, email: **Prof. Dr. Pavel Tlustos, tlustos@af.czu.cz**

Konzultant (včetně titulů)/*Co-supervisor*: **Dr. Pavel Svehla**

Forma studia/*Form of Study*: **Full_time**

Téma/Theme: The Control of Nitrification Process in Water Environment at Extremely High Concentration of Ammonia and other Substances

Hypotéza/ Hypothesis: The control of nitrification process consisting mainly in the adjustment of pH and dissolved oxygen concentration will lead to the initiation and to the long-term maintenance of the activity of nitrifying bacteria even in extreme conditions prevailing in the liquid phase of the digestate, landfill leachate etc. In addition, the application of suitable strategy of the flow of treated water (continual x semi-continual) will be possible to use for the optimization of this process. Thanks to reasonable strategy of the nitrification process control, the process of the biology treatment of the liquid phase of the digestate could be optimized. Similarly, also the process of biological treatment of wastewaters containing large amount of ammonia will be possible to optimize by the operation of the system at optimal conditions.

Anotace/Annotation: Nitrification is very important process for the nitrogen cycle in the nature. It is taking place at different conditions in water environment as well as in the soil. The nitrification represents very important process for biological wastewater treatment. During the nitrification, ammonia is firstly converted to nitrite by ammonia oxidisers. Consequently, the nitrite is oxidised to nitrate by the nitrite oxidising bacteria. Despite the ammonia represents the substrate for ammonia oxidisers, it may inhibit their activity at higher concentration. Nitrite oxidising bacteria seem to be even more sensitive towards the ammonia as compared with ammonia oxidising bacteria. The inhibition becomes to be intensive mainly at higher pH values by the reason of the increase of the representation of un-dissociated ammonia under such conditions. The nitrite produced by ammonia oxidising bacteria may also inhibit the activity of both group of nitrifying bacteria. Nitrifying bacteria may be sensitive even towards higher concentration of organic compounds.
The aim of this Ph.D. thesis is to suggest suitable methods for the control of nitrification process applied in aquatic environment with extremely high concentration of ammonia as well as organic compounds. Main attention will paid to the maximization of nitrification rate and minimisation of nitrite accumulation during the treatment of the liquid phase of the digestate performed by the reason of the prevention of nitrogen losses during the handling with this material. Simultaneously, optimal conditions for the application of so called short-cut nitrification during biological treatment of landfill leachate and other wastewater streams characterised by similar properties by the method of short-cut nitrification/ANAMMOX (Anaerobic ammonium oxidation) will be defined.

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