

¹Institute of Sanitary Engineering, Water Quality and Solid Waste Management (ISWA), Chair of Hydrochemistry and Hydrobiology, University of Stuttgart, Bandtale 2, 70569 Stuttgart, Germany, Email: joerg.metzger@iswa.uni-stuttgart.de
²Institute of Technical Biochemistry (ITB), University of Stuttgart, Allmandring 31, 70569 Stuttgart, Germany, Email: itbta@po.uni-stuttgart.de

Introduction

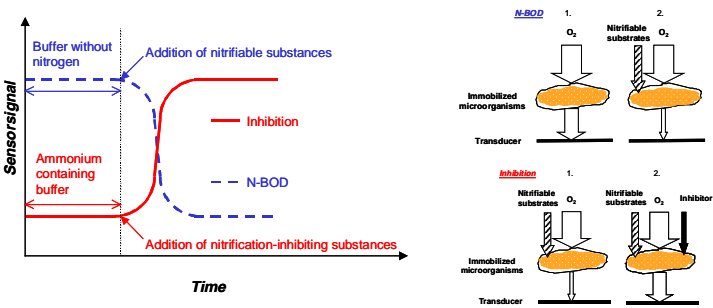
Malfunctions of the nitrification step in sewage plants have an environmental impact caused by high effluent concentrations of ammonium and nitrite ions in surface waters. They are mainly caused by industrial wastewaters, because they often contain shock loads of toxicants that inhibit the nitrification process. Furthermore, high concentrations of nitrifiable substances (N-BOD) can cause an overload of the nitrification capacity. Therefore miniaturised disposable biosensors based on thick-film technology were developed and integrated in a multi-channel device. The aim of this biosensor system is to enable the direct, rapid and reliable detection of disturbances in wastewater treatment plants.

Material & Methods

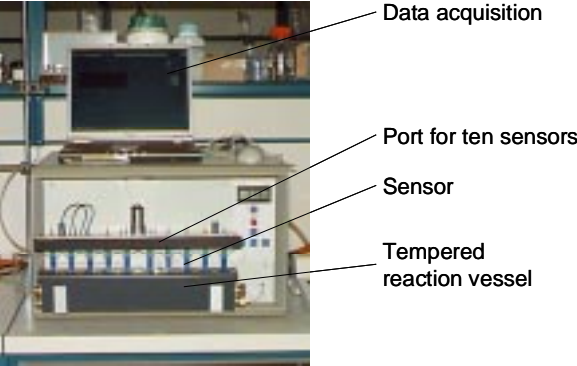
Disposable nitrification biosensors

1. **Transducer:** Screen-printed oxygen electrodes (SPOE's)
2. **Microorganisms:** Mixed nitrifying culture, enriched out of activated sludge from the wastewater treatment plant Stuttgart-Busnau
3. **Immobilization:** Photocrosslinkable polyvinyl alcohol

Detection of nitrifiable and inhibiting substances



Multi-channel device



Results (SPOE's)

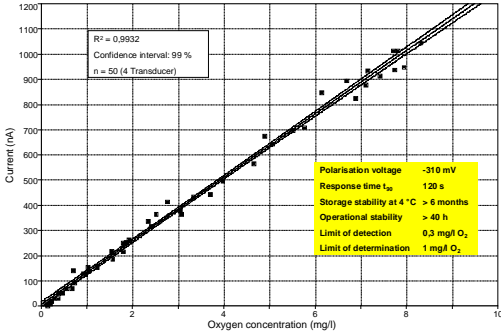


Figure 1: Dependency of the transducer signal on oxygen concentration. The operational parameters of SPOE's are shown in the table inside the figure.

Conclusion

The biosensor system is usable for environmental samples.

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Results (Biosensor)

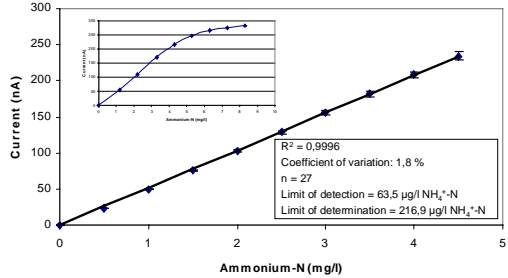


Figure 2: Signal of nitrification biosensors originating from different ammonium standard solutions. Illustrated is the linear range and the saturation kinetic of these sensors.

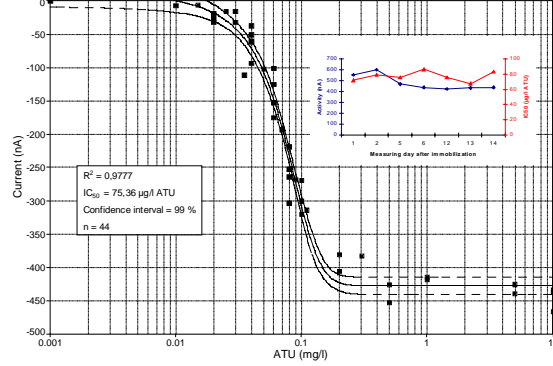


Figure 3: Sigmoidal concentration dependency of the biosensors on the inhibitor allythiourea (ATU) over a period of about two weeks. It is shown that the activity and sensitivity of the sensor are nearly constant.