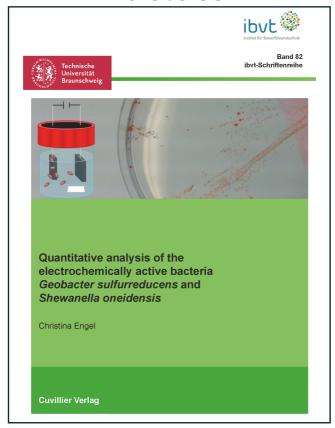


## Christina Engel (Autor)

## Quantitative analysis of the electrochemically active bacteria Geobacter sulfurreducens and Shewanella oneidensis



https://cuvillier.de/de/shop/publications/8235

## Copyright:

Cuvillier Verlag, Inhaberin Annette Jentzsch-Cuvillier, Nonnenstieg 8, 37075 Göttingen, Germany

Telefon: +49 (0)551 54724-0, E-Mail: info@cuvillier.de, Website: https://cuvillier.de



## Table of Content

1	Introduction		I
	1.1	Redox reactions – the energetics of electron transfer	2
	1.2	Bioelectrochemical systems – making use of the energy from redox reactions	
	1.3	Electrochemically active bacteria	
	1.4	Extracellular electron transfer by G. sulfurreducens and S. oneidensis	7
	1.5	Techniques used to study electrochemically active bacteria	12
	1.6	Specific research questions regarding the goals of this thesis	14
	1.6.1	Mixed or pure culture – who's the winner?	14
	1.6.2	What is the optimal anode potential?	
	1.6.3	Special characteristics of the metabolism of G. sulfurreducens	17
2	Mate	rials and Methods	21
	2.1	Bacterial strains and cultivation media	21
	2.2	Cultivation conditions for precultures	
	2.3	Setup of microbial electrolysis cell	
	2.4	Electrochemical cultivation and techniques	27
	2.5	Cell fixation and flow cytometry analysis	30
	2.6	Confocal laser scanning microscopy	
	2.7	Microaerobic cultivation in bioreactor system	32
	2.8	Determination of volumetric mass transfer coefficient and maximum dissolved oxygen	
	concent	ation	34
	2.9	Microarray based transcriptome analysis	35
	2.10	High performance liquid chromatography methodology	36
3	Results and Discussion		38
	3.1	Mixed and pure cultures in microbial electrolysis cell	38
	3.1.1	Current production of pure cultures and mixed culture	38
	3.1.2	Long-term behaviour of defined mixed culture	45
	3.1.3	Biofilm formation on anodes	51
	3.1.4	Electrochemical characterisation by cyclic voltammetry	55
	3.2	Influence of the anode potential on defined mixed culture	60
	3.3	Microaerobic growth of Geobacter sulfurreducens	
	3.3.1	Comparison of aerobic and anaerobic growth conditions	66
	3.3.2	Metabolisation of selected organic acids	
	3.3.3	Transcriptome analysis under anaerobic and microaerobic conditions	76
4	Conc	lusion	83
5	Refe	ences	85
6	Appe	ndix	96