Energy from wastewater

Microbial electrochemical wastewater treatment

HELMHOLTZ Zentrum für Umweltforschung

High energy potential in wastewater

- Currently, wastewater treatment in industrial countries is an energy-intensive process. It is estimated that 20% of municipal electricity consumption in Germany is used for wastewater treatment [1].
- At the same time, wastewater has a considerable energy content
- Sample calculation: Wastewater treatment plant size 4, 55000 P.E. (2.5 million m3 wastewater per year), if only domestic wastewater is used, 450 MWh per year would be possible (with only 10% efficiency)

UFZ-Know-how:

- Design of the fuel cell
- Process management

UFZ-Experts:

Prof. Dr. Falk Harnisch
Dr. Benjamin Korth

Further information

[1] K. Fricke, Energieeffizienz kommunaler Kläranlagen, Umweltbundesamt, Dessau-Roßlau, 2009.

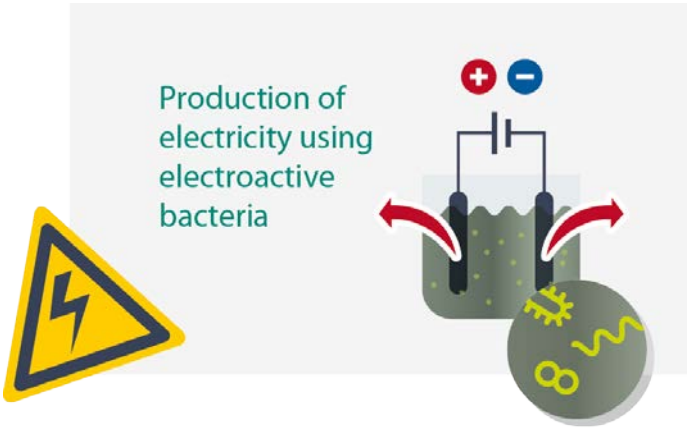
[2] Biores. Technol. 163 (2014) 206-213

[3] Biores. Technol. 198 (2015) 913-917

[4] DECHEMA Positionspapier Die Bioelektrosynthese als essentieller Baustein der Bioökonomie (2019)

The UFZ Approach – Bioelectrochemistry

- Schematic structure of a microbial fuel cell for the generation of electrical energy from waste water: The waste water flows into the anode chamber, where the energy-rich components contained are oxidized by the microorganisms. The electrons released in the process are transferred to the anode by EET and flow via the external consumer to the cathode. The thus cleaned waste water flows off again. At the cathode, the released electrons are transferred to oxygen, which is reduced. An ion transfer takes place between anode and cathode as charge balance. Translated with www.DeepL.com/Translator (free version)



- Technical maturity: pilot plant scale (16 L volume) in batch process and continuous operation with municipal wastewater

- Results:

HRT	1,2 days
Average CSB_{in}:	0,54 g L^{-1}
CSB_{out} :	< 210 mg L^{-1}
CSB-removal:	67 %
Nitrogen recovery (NH_4^+):	40 %

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