

- 1 ED process with bipolar membranes for salt splitting into acid and base.
- 2 Simulation (COMSOL Multiphysics® software) of the potential drops across ion exchange membranes and electrolytes of an ED stack.

ELECTRODIALYSIS (ED)

Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB

Nobelstrasse 12
70569 Stuttgart
Germany

Contact

Dr.-Ing. Berta Spasova
Phone +49 711 970-4092
berta.spasova@igb.fraunhofer.de

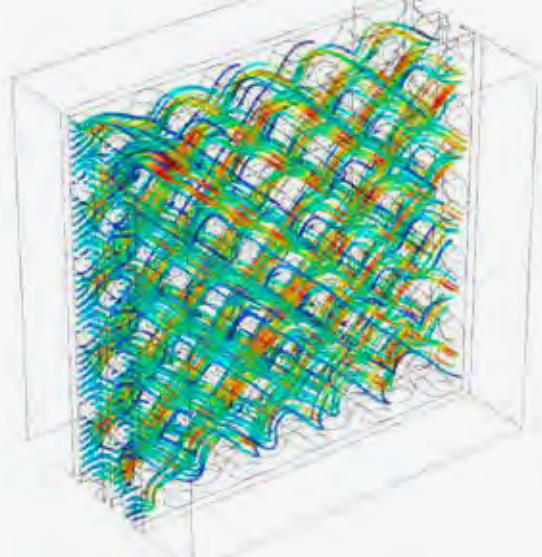
Dr.-Ing. Carsten Pietzka
Phone +49 711 970-4115
carsten.pietzka@igb.fraunhofer.de

www.igb.fraunhofer.de

Electrodialysis (ED) is a process where ions are separated from electrolytes across semi-permeable ion exchange membranes under the effect of an applied electric field. One of the most common applications of ED is the desalination of sea or brackish water. Using selective ion exchange membranes, ED can be further used for the selective separation and recovery of acids or metals from process solutions. Electrodialysis with bipolar membranes for water splitting opens further applications like acid and base production from salt solutions or pH adjustment.

Performance characteristics

- The process can be adjusted according to specific requirements by the configuration of the membrane stack.
- A wide inlet concentration range can be treated: From below 1 mS/cm conductivity to almost saturated salt solutions or high acid concentrations.
- No chemicals are required except for cleaning purposes.
- Bipolar membranes enable energy-efficient water splitting into protons and hydroxide ions (acid and base production).
- Selective membranes allow for a specific treatment.



3



4

Application areas

- Recovery of 10–15 % sulphuric acid from metal or galvanic process solutions
- Salt splitting into corresponding acid and base
- Separation of inorganic nutrients and organic acids from silage juices
- Ammonium removal from wastewater or process water
- pH adjustment in biotechnology and food industry
- Separation of monovalent from di- or trivalent ions with high selectivity
- Ion exchange processes

Our service offers

- Material flow management
- Analytics and characterization
- Conceptual design
- Customized, application-specific solutions (process, technology, system)
- Simulation and modelling
- Process analysis and optimization
- Process, technology and prototype development
- Dimensioning (up to industrial scale)
- Customized developments and adaptations
- Process and plant design
- Process and system integration
- Testing, benchmarking and validation
- Economic evaluation
- Equipment delivery in cooperation with our industrial partners

Our equipment

- Laboratory ED cells with 100 cm² and 1000 cm² membrane area
- Flexible ED test system
- Mobile ED demonstration system
- Ion exchange membranes for various applications (established contacts to several membrane suppliers)
- Technologies for pre-treatment of the electrolytes (e.g. membrane filtration)
- Technical and chemical laboratories
- In-house chemical analysis
- COMSOL Multiphysics® simulation software for process modelling

Reference projects

- NovEED – A novel energy efficient electro dialysis cell to recycle acids and bases from industrial process water based on new types of electrodes to enable internal energy recovery, EU (grant agreement no 606304)
Further information:
www.igb.fraunhofer.de/en/noveed
- ECOWAMA – ECO-efficient management of WATER in the MANufacturing industry, EU (grant agreement no 308432)
Further information:
www.igb.fraunhofer.de/en/ecowama
- GOBi – Holistic optimization of the biogas process chain, BMBF
Further information:
www.igb.fraunhofer.de/en/gobi

Further information

For more detailed information on our research in the field of electro dialysis please visit our website:

www.igb.fraunhofer.de/electrodialysis

- 3 *Simulation (COMSOL Multiphysics® software) of fluid flow around a spacer mesh in an ED stack.*
- 4 *Mobile flexible ED demonstration unit.*