

fumasep® FBM

General

The fumasep® FBM single film Bipolar Membrane consists of an anion exchange layer and a cation exchange layer manufactured using a patented multilayer-coating production technology.

This composite membrane is chemically stable and mechanically reinforced with woven PEEK. In the intermediate layer between anion exchange layer (AEL) and cation exchange layer (CEL) water is catalytically active to force dissociation of water into OH⁻ and H⁺ ions when exceeding a potential difference of approximately 0.8 V. The membrane should not be operated under forward biased conditions which may cause blistering. The CEL must be directed towards the cathode, the AEL must be directed towards the anode, and the mode of operation has to be reverse biased to promote water dissociation reaction. If the membrane is used in the wrong position at high current density even for short term (specifically referring to forward biasing scenario), the intermediate layer may degrade (blistering), and the monolayers may delaminate.

The electro-catalytically forced water dissociation produces – in contrast to the classical electrolysis of water – no reaction gases. Therefore, one Mol of OH⁻ and H⁺ ions can be achieved at an energy value of approximately 22 Wh (Electrolysis: approximately 55 Wh per Mol).

The fumasep® FBM membranes are easy to use and show:

- High water splitting efficiency (>98% at 100 mA cm⁻² in 0.5 M NaCl @ 25 °C)
- Low water splitting voltage (< 1.2 V at 100 mA cm⁻² in 0.5 M NaCl @ 25 °C)
- Excellent mechanical properties at low thickness (0.13 – 0.16 mm)

Membranes are identified by membrane type and identification number (Lot.-Number). Please refer to this type and identification number in case of queries.

Delivery

The membrane is the brown foil delivered in wet form.

Handling and Storage

Please pay attention that the membrane surface is not contaminated with surface active agents or will be damaged by mechanical influence.

High attention must be given to the right polarity when using the membranes!

When mounting the membranes it is imperative that the membrane sides will not get mixed up. Therefore, the cation side is marked with '**cathode side**'. This side must be directed towards the cathode (see also drawing overleaf).

The membrane should be stored in 1 M NaCl-solution and placed in a closed container. If storage will be for a longer period of time 100 ppm of NaN₃ should be added to prevent biological growth. Other biocides have not been used as yet.

The membrane is not stable against chlorine (Cl₂).

If you have any concerns before proceeding, please feel free to contact us for further information.

Technical Data Sheet fumasep® FBM

fumasep®		FBM
membrane type		bipolar
appearance / colour		transparent / brown
backing foil		none
reinforcement		PK
counter ion		Na (CEL layer) / Cl (AEL layer)
delivery form		wet in NaCl solution
thickness (dry)	µm	130 - 160
weight per unit area (dry)	mg cm ⁻²	15 - 17
dimensional swelling H ₂ O at T = 25 °C ^{a)}	%	0
water splitting voltage at 100 mA cm ⁻² b)	V	< 1.2
water splitting efficiency at 100 mA cm ⁻² b)	%	> 98
maximum operation temperature	°C	40

a) reference membrane as received

b) in 0.5 M NaCl solution and 0.25 M Na₂SO₄ electrode rinse solution at 25 °C.

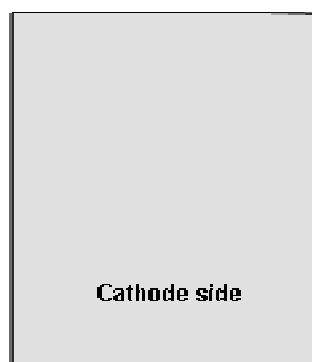
Pretreatment

The membrane is delivered in wet form and ready to use. Assembling is possible in wet form only. Do not let the membrane dry out since micro-cracks may likely occur during shrinkage.

If you have any concerns about storage, chemical stability, and pretreatment please feel free to contact us for further information.

See following drawing for correct orientation of the membrane side. The cation exchange side is marked with '**cathode side**'.

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Please note: The measuring data are not measured directly on the item supplied. The data correspond with the measurement of our quality control.

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Current – Voltage Characteristics: fumasep® FBM

4-chamber set-up: cathode – Na₂SO₄ – CEM – NaCl – FBM – NaCl – CEM – Na₂SO₄ solution – anode

4-probe measurement: Haber-Luggin capillary (3 M KCl) with Ag / AgCl reference electrodes

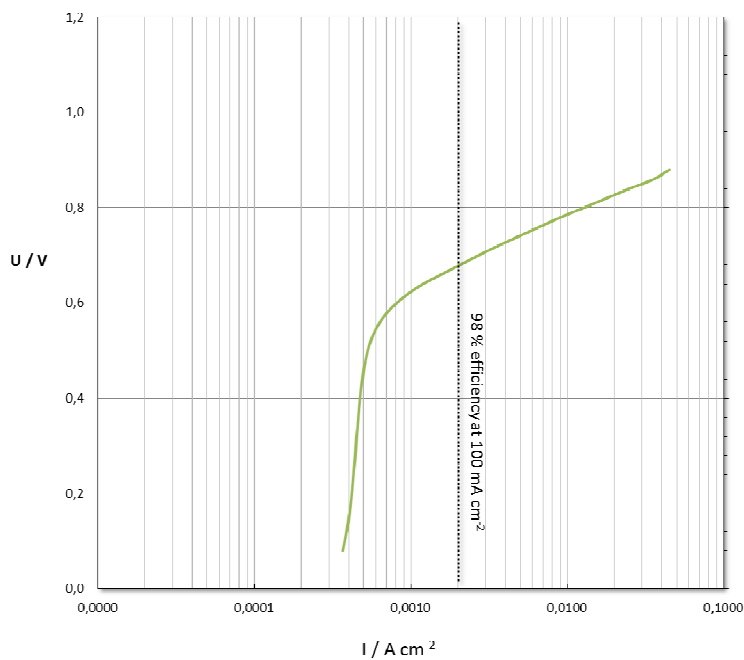
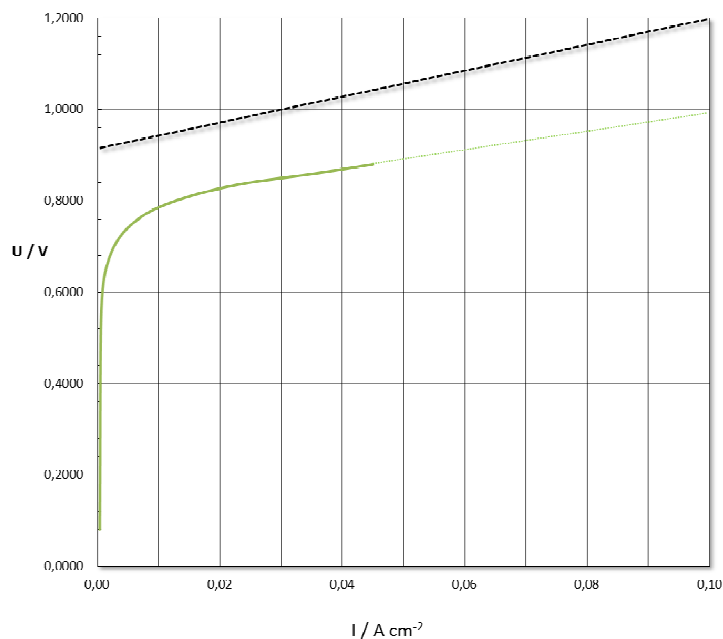
CEM: Cation exchange membrane FKB

electrolyte loop: 0.5 M NaCl solution / recombined

electrode loop: 0.25 M Na₂SO₄ / recombined

temperature: 25 °C

fixed scan rate, $\Delta U = 20$ mV, $\Delta t = 20$ s



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