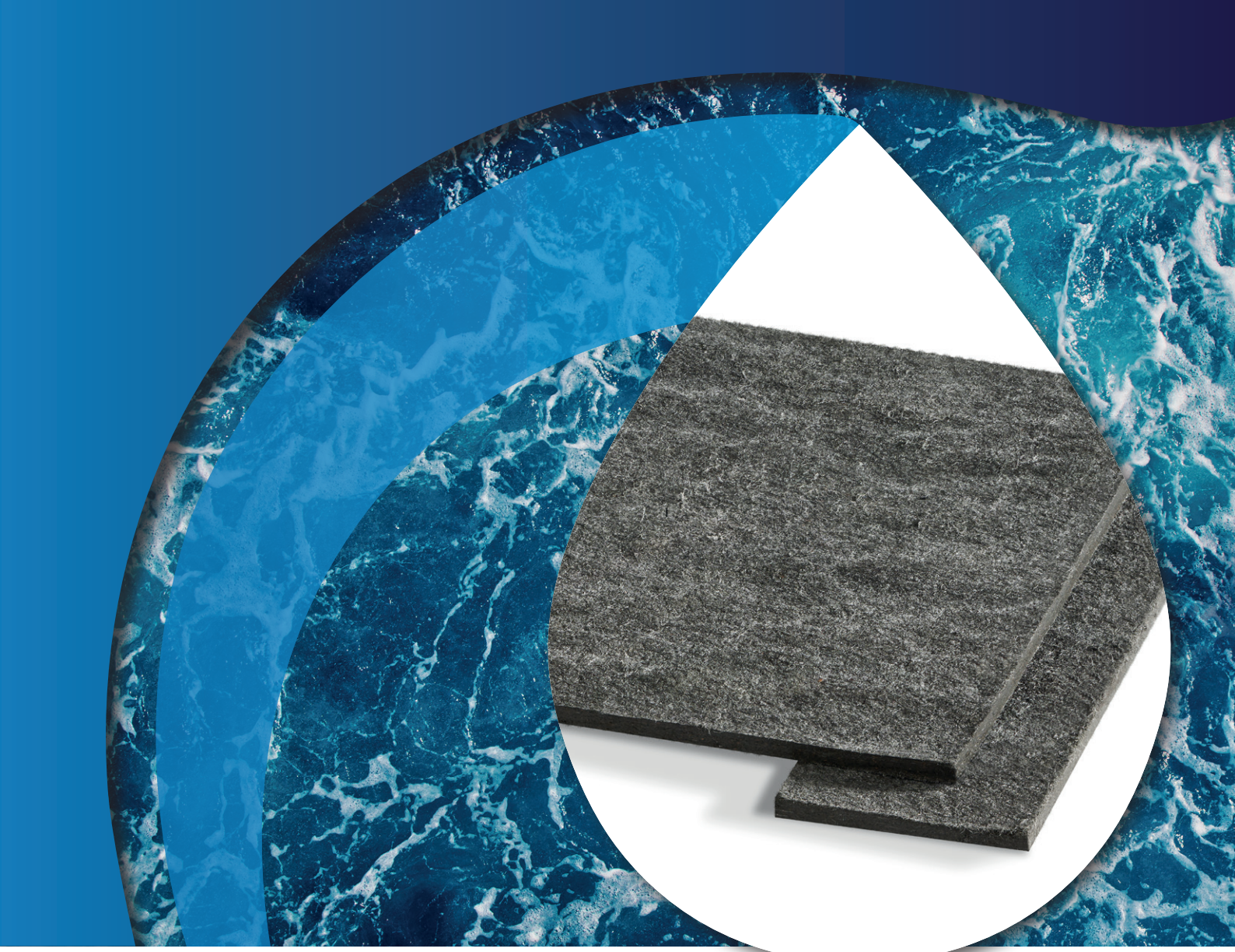


BluAct Membranes

Remove Heavy Metal Ions and Radioactive Waste from Water.

ENWOTEC
FILTRATION & PROCESS CONSULTING

BluAct Technologies

BluAct Membranes

ProMembrane 2.1 is made from protein fibers and activated porous carbon, and can be used to remove heavy metal ions and radioactive waste from water. The retention rate can be adjusted to suit particular needs for remediating colloidal and biological contamination by size exclusion.

ProMembrane 2.1 is compatible with the current plate and frame filter press separation machines, and therefore, it fits in any existing filter equipment. The membrane is best suitable for water and wastewater treatment plants for various industries, such as food processing, pharmaceuticals, semiconductor, public organizations, municipals and more. ProMembrane 2.2 is a special version conceived to treat water additionally contaminated by arsenic.

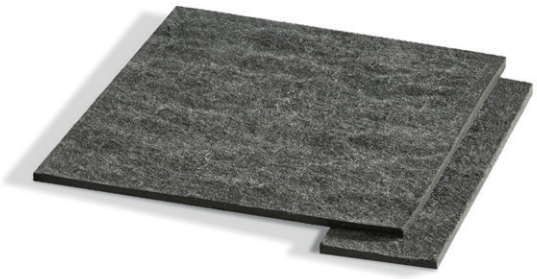
The protein fibers have numerous amino acid binding sites on which Individual metal ions can adsorb. The combination of proteins fibers with activated carbon, further delays the saturation level of these membranes, allowing the capture of even larger quantities of heavy metals, which can then be converted into valuable metal nanoparticles via chemical or thermal reduction.

Composition membrane

- Activated carbon
- Fibril based from β-lactoglobulin or other proteins
- Cellulose as binding matrix
- Available on demand from other proteins

Advantages

- Multiple Pollutants removal
- High retention of heavy metals
- Absorbs radioactive substances
- Fits in any already existing filter press
- Available for small quantities
- Universally applicable
- Scalable to any size
- Gravity filtration, without any energy requirement.



Broad Range Pollutants removal

ProMembrane compared to other technologies

Technology	MF	UF	Activated Carbon	Iron-based adsorbent	Ion exchange resins	NF	RO	BluAct 2.1
Bacteria	✔	✔	✘	✘	✘	✔	✔	✔
Suspendid solids	✔	✔	✘	✘	✘	✔	✔	✔
Organic pollutants	✘	✘	✔	✘	✘	✔	✔	✔
Heavy metal ions	✘	✘	✘	✔	✘	✔	✔	✔
No change in healthy minerals ions composition	✔	✔	✔	✔	✘	✔	✘	✔
Low energy consumption	✔	✘	✔	✔	✘	✘	✘	✔
Water recovery efficiency	✔	✔	✔	✔	✔	✔	✘	✔

Efficiency

Removal efficiencies

Natural and waste-water heavy metals

Arsenic (V & III)	99.9 %
Lead	99.9 %
Mercury	99.5 %
Nickel	99.8 %
Chromium	99.2 %
Aluminium	98.0 %

Radioactive Pollutants

Technetium (Tc-99m)	99.9 %
Iodine (I-123)	99.9 %
Gallium (Ga-68)	99.8 %
Lutetium (Lu-177)	99.9 %
Iodine (I- 131)	99.9 %
Uranium	99.3 %
Cesium (Cs-137)	99.7 %
Phosphorous (P-32)	99.8 %

Precious metals removal and recovery

Gold cyanide and chloride	99.6 %
Platinum	99.9 %
Silver	99.8 %
Palladium	99.8 %

Organic Pollutants

Acetoamenophene	99.9 %
Desethylatrazine	99.9 %
Acesulfame	99.9 %

Other Pollutants

Fluoride	99.5 %
PFAS and Micropollutants	> 97.0 %

Also efficient in removal of Vanadium, Molybdenum, Antimony, Zinc, Hydrogen sulfide, Phosphate, Silicates, Copper and wide range of organic pollutants (pesticides, pharmaceuticals)

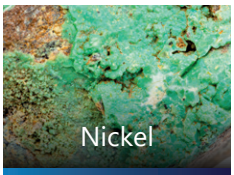
NSF53 standards

Representative examples

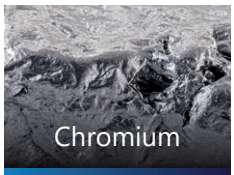
99.66%

99.98%

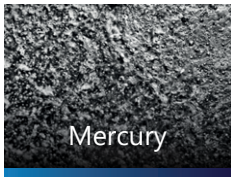
99.87%



99.86%

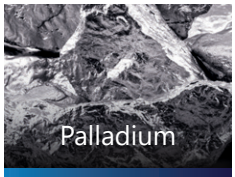


99.28%



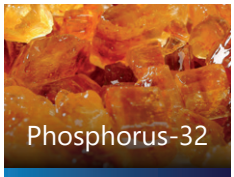
99.52%

98.00%



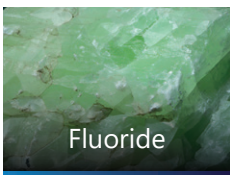
99.84%

99.35%

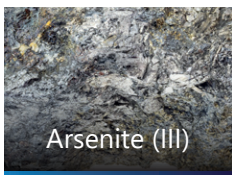


99.88%

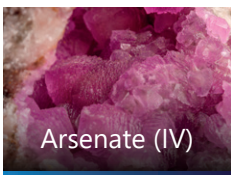
99.97%



99.50%



99.90%



99.90%

Capacity, Energy and Cost of Filtration

Adsorption capacities
Depends on each individual pollutants:
on average ≈0.5-1.0 g/m2 of the membrane

Cost of the filtration
Total cost of ownership (Opex & Capex)
@ moderate pollution levels: ≈0.15-0.5 USD/m^3

Energy usage
0.075-0.1 kWh/m^3

CO_2: Compared to reverse osmosis, the BluAct technology saves 130 kg of CO_2 every 1.000 m^3 of purified water!

Representative arsenic data: approximate removal capacity at various arsenic contamination levels.

Contamination Levels	Adsorption capacity of 1 m^2 Promembrane (m^3)
Arsenic contamination 20 µg/L	**> 17 – 28**
Arsenic contamination 100 µg/L	**> 4 – 7**
Arsenic contamination 300 µg/L	**1.5 – 2.8**
Arsenic contamination 850 µg/L	**> 0.2**

Technical Specification

Membrane thickness
3-4 mm

Maximum operating temperature
95° C

Maximum operating pressure
10 bar

Maximum differential pressure during filtration
150 kPa, 1.5 bar at 20°C (*)

Maximal pressure during cleaning
300 kPa, 3.0 bar at 20°C (*)
200 kPa, 2.0 bar at 40°C (*)

Flow rate
10 to 3.000 Liter/m2/min.

Membrane pore sizes
0.5 to 10 µm

Regeneration / Backflushing
In certain applications, it is possible to regenerate the filter and recover the precious metals or extend the lifetime of the membrane. Please follow our special instructions for this purpose.

Sterilization
The sheets can be sterilized with hot water (85 °C) or inline steam (125 °C).

Safety
No adverse effects are known when the product is used in accordance with its intended purpose. No safety data are required for the diaphragms. Storage, handling and transportation are not hazardous to humans or the environment.

Disposal
The membranes are to be treated as industrial waste during disposal. Please note, in consideration of the filtered product, the local and official regulations must be observed.

Storage
The membranes should be stored in original packaging in a dry and odorless place, protected against UV radiation. The membranes should be used within 36 months of the date of production.

Quality tested
During the manufacturing process, the membranes are continuously tested for consistently high product quality.

Applications

Our products are ideal to remove organic, inorganic, biological and micro pollutant contaminants from virtually any application sector, including industrial wastewater, Municipal water and radioactive wastewater treatment from hospitals and nuclear power industries.

Industrial water treatment
- Electroplating water treatment
- Mining and rare earth metal recovery
- Acid mine drainage
- Food and beverage applications
- Chemical waste water treatment

Municipal water
- Municipal water treatment

Radioactive wastewater treatment
- Hospital radionuclide waste treatment
- Nuclear energy radioactive water treatment

	Decolorization	Benefits
Chemical industry	API · Silicon oils Solvents · Fine chemicals	Catalyst recovery Heavy metal reduction Removal of organic impurities Decolorization
Flavors & fragrances industry	Plant / herbal extracts Fragrances	Deodorization of ethanol Removal of pesticides from extracts
Food & beverage industry	Sugar syrup Spirits Cider	Removal of off-tastes from spirits Removal of bitterness from soups Decolorization
Biopharmaceutical industry	Albumin Vitamins Antibiotics Vaccines	Removal of PKA from human plasma fractions · Removal of endotoxins Removal of organic impurities from contrast liquids

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