

QUALITY PURIFIES.



Potable water purification with high-performance products from LANXESS

X Lewatit®

X Lewabrane®

X Bayoxide®

QUALITY WORKS.

LANXESS
Energizing Chemistry



LANXESS is one of the world's foremost suppliers of products for treating water and other liquid media. We have more than 80 years of experience in water treatment and are a leader in the development and production of ion exchange resins. Furthermore, LANXESS develops and manufactures reverse osmosis membrane elements. We operate production facilities at our sites in Leverkusen and Bitterfeld, Germany, and in Jhagadia, India.

THREE TECHNOLOGIES, ONE VISION

CLEAN WATER

The shortage of clean water has become a global problem with a serious impact on people's health. Population growth, air pollution and climate change will further aggravate the situation, especially in megacities, and city managers will have to carefully manage their available clean water resources. To cope with these challenges, products and solutions from LANXESS help to keep water free of harmful substances and produce clean water for humans and animals to drink.

Lewatit® ion exchange resins and **Bayoxide®** iron oxide adsorbers offer the unique ability to selectively bind and remove ions from drinking water and wastewater. Unwanted and toxic constituents such as arsenic, nitrate, lead, chromate, mercury, and surfactants can be removed efficiently and clean water can be globally generated. **Lewatit®** ion exchange resins provide savings on investment and operation by less frequent regenerations and resin refills. Highly pure water can then be generated in compliance with drinking water standards.

If not a selective removal but a complete desalination, is required, **Lewabrane®** reverse osmosis membranes offer an efficient possibility to convert water of low quality to a drinking water standard. Depending on the salinity of the water, very energy-efficient ultra low pressure (ULP), standard brackish water elements with high performance (B-HP), or seawater (S-HR or S-HF) elements can be used. Of course, all of them are certified by the NSF.

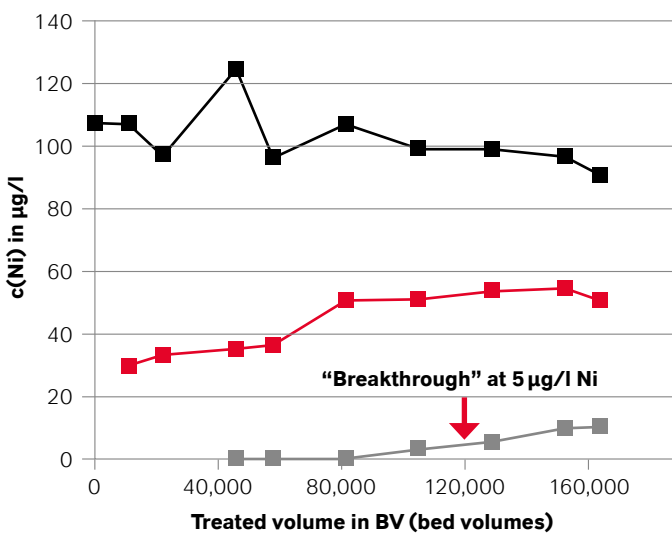


Nickel removal with Lewatit® MonoPlus TP 207

The contamination of groundwater with carcinogenic and allergenic heavy metals is a rising issue because concentrations are increasing due to man-made water acidification and overfertilization. Lewatit® MonoPlus TP 207 chelating resins are ideal because of the high selectivity and the monodisperse and homogenous bead and bed structure providing superior kinetics.

- Operating capacities up to 13 g/l and the high specific flow rate of 70 BV/h
- Compliance with the public health goal of 5 ppb
- Batch related food contact statement available

Nickel removal with Lewatit® MonoPlus TP 207: influent concentration (black), effluent concentration of working column (red), effluent concentration polishing column (grey)



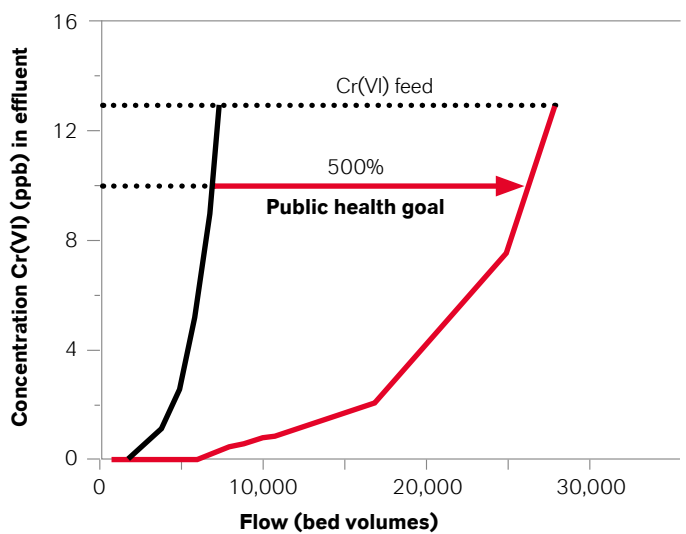
■ Feed column 1 ■ Effluent column 1 ■ Effluent column 2

Chromium (VI) contaminated groundwater purification with Lewatit® TP 107

The ion exchange resin removes oxyanions such as chromate, molybdate, and vanadate very efficiently.

- Up to 5 times higher Cr(VI) removal capacities compared with conventional strong base anion exchange resins
- Low effluent concentration well below maximal tolerated level of 10 ppb
- High tolerance towards background constituents such as chloride and sulfate
- NSF/ANSI 61 drinking water certificate available

Hexavalent chromate removal with Lewatit® TP 107 (red) and a conventional resin (black) from drinking water: Lewatit® TP 107 shows an increased operating capacity of 500%.



— Conventional resin — Lewatit® TP 107



Arsenic removal with **Bayoxide® E 33** and **Bayoxide® E 33 HC**

Inorganic arsenic is a highly toxic water contaminant, which enters groundwater by mineral extraction and mining activities. LANXESS adsorbers help people globally to live healthily by relieving their drinking water of arsenic concentrations to well below the WHO limit of 10 ppb.

Properties **Bayoxide® E 33 / E 33 HC**

- Arsenic removal below 5 µg/l
- NSF/ANSI 61 certified, products compliant to DWI
- High abrasion stability of **Bayoxide® E 33** and very high abrasion stability of **Bayoxide® E 33 HC** compared to standard media
- **Bayoxide® E 33** has high adsorption capacity due to high surface area (approx. 150 m²/g)
- **Bayoxide® E 33 HC** has a very high adsorption capacity (approx. 300 m²/g)
- Longer contact times necessary for **Bayoxide® E 33 HC**, therefore only limited use for drinking water, due to economical reasons, only special applications
- Simple once-through treatment system with gravel underbedding, low investment costs
- Low maintenance requirements
- No handling of regeneration chemicals necessary
- Usually arsenic exhausted material disposable via non-hazardous landfill

Arsenic removal with **Bayoxide®**



Bayoxide® E 33



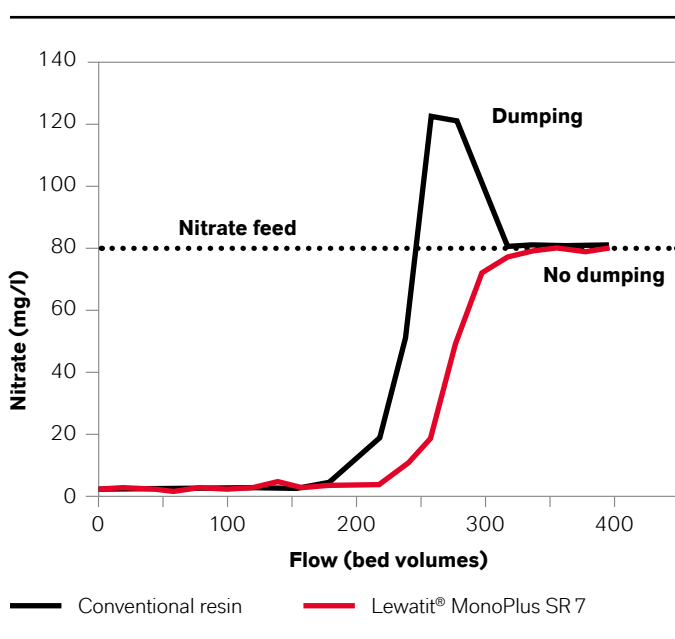
Bayoxide® E 33 HC

Nitrate removal from contaminated groundwater with **Lewatit® MonoPlus SR 7**

Nitrate, which is toxic to infants and causes cancer, is efficiently removed with ion exchange resins from LANXESS.

- The resin removes nitrate with operating capacities up to 20 g/l and low effluent concentrations are obtained
- High tolerance towards background constituents such as chloride and sulfate
- Resin shows no nitrate dumping at the end of the cycle: safe nitrate removal below the current WHO drinking water limit of 50 ppm and even below the recommendation of 10 ppm by EPA (Environmental Protection Agency)

Nitrate removal with **Lewatit® MonoPlus SR 7 (red)** and a conventional resin (black): **Lewatit® MonoPlus SR 7 shows no nitrate dumping effect.**



Alternatively, some part of the water can be treated with **Lewabrane®** membrane. Since the removal is then almost complete, it can be blended with the non-treated water to achieve the requested value. Typical membranes for nitrate removal are B400 ULP ASD, B400 LE ASD, and B400 HP, depending on the salinity level.

Uranium removal with Lewatit® DW 630

Uranium-contaminated drinking water is generated by extraction from minerals in the ground as well as from mining activities. Lewatit® DW 630 is excellently suited to removing this hazardous contaminant from drinking water efficiently with high operating capacities and low effluent concentrations below the public health limit.

- Effluent concentrations below 1 ppb ensure the safe compliance with the WHO goal of 10 ppb
- High resin operating capacity at a high water throughput up to 80 BV/h provides savings on operational costs
- High drinking water quality achieved by selective exchange of contaminants. Other water components generating water taste are left behind
- Gel-type styrenic SBA resin in sulfate form exchanges uranium as anionic sulfate and carbonate complexes, total capacity = 1.1 eq/l
- Manufactured in accordance with a certified Quality Assurance System and in accordance with the recommendations of the Resolution ResAP (2004)3 of the Council of Europe on ion exchange and adsorbents resins used in the processing of foodstuffs



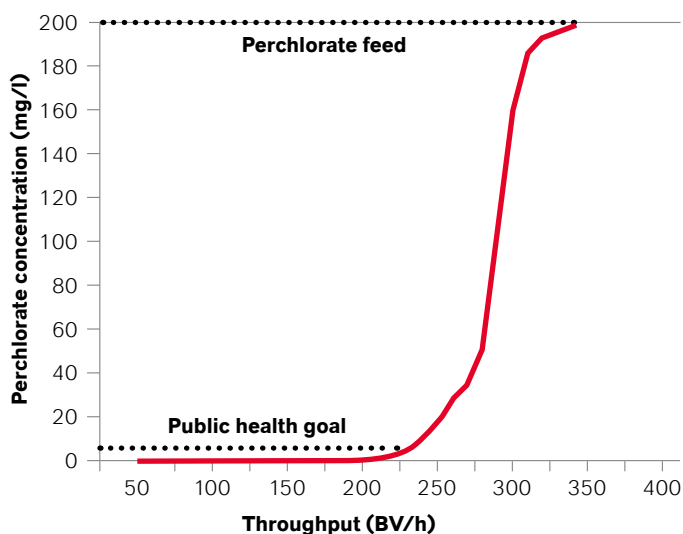
■ Lewatit® DW 630 ion exchange filters removing toxic uranium from water

Perchlorate and chlorate removal with Lewatit® TP 106

Perchlorate and chlorate cause adverse health effects and enter the groundwater via industries producing rocket fuel, explosives, bleach and pesticides.

- Savings in investment costs by less frequent resin refills provided by the very efficient perchlorate removal with operating capacities up to 50 g/l
- Compliance with public health goal of 10 ppb by low perchlorate and chlorate effluent concentrations
- High tolerance towards background constituents such as chloride and sulfate
- Gel-type styrenic SBA resin with total capacity = 0.65 eq/l
- NSF/ANSI 61 drinking water certificate available

Perchlorate removal with Lewatit® TP 106: effluent concentrations are obtained well below the public health goal.



Removal of natural organic matter (NOM) using Lewatit® S 5128

Natural organic matter (NOM) forms toxic compounds when in contact with disinfectants. Additionally, NOM has a negative influence on color and taste and causes bacteria growth. Because natural organic matter consists of polyanionic compounds it can be efficiently removed with ion exchange resins from LANXESS.

- **Lewatit® S 5128** removes NOM very efficiently with operating capacities up to 15 g/l and low effluent concentrations are obtained. Safe drinking water limit of 5 ppm can be achieved
- Savings on operational costs by regenerability of the resin

Removal of micro pollutants from drinking water sources with Lewabrane® reverse osmosis

The removal of micro pollutants from wastewater is an important task in the current discussion regarding water quality. One technology that could solve this issue is reverse osmosis. As a pressure-driven membrane process with a dense membrane, the rejection of micro pollutants is high. Below is a table of the rejection of some micro pollutants using an ultra low pressure (ULP) reverse osmosis membrane based on laboratory tests.

Table 1: Separation of micro pollutants by Lewabrane® reverse osmosis membranes showing exceptionally high rejections

Pollutant	Measured rejection (%)	Substance class
Iomeprol	98.7	Contrast agent
Acesulfame	90.4	Sweetener
Carbamazepine	99.3	Anticonvulsant
Mecoprop	99.0	Herbicide
Diclofenac	99.6	Nonsteroidal anti-inflammatory drug
Ibuprofen	99.6	Nonsteroidal anti-inflammatory drug

Coupon test: < 5 µg/l substance, 500 mg/l NaCl, pH 7, 25 °C, 7.6 bar
Membrane type: Lewabrane® ULP

Table 2: Overview of LANXESS products for drinking water applications

Pollutant	Chelate resin	Strong base anion exchange resin (SBA)					Iron hydroxide adsorber	
	Lewatit® TP 207	Lewatit® MonoPlus SR 7	Lewatit® TP 106	Lewatit® TP 107	Lewatit® S 5128	Lewatit® DW 630	Bayoxide® E 33	Bayoxide® E 33 HC
Ni ²⁺	■ ¹⁾							
CrO ₄ ²⁻								■ ²⁾
AsO ₄ ³⁻							■ ³⁾	■ ³⁾
NO ₃ ⁻		■ ⁴⁾						
UO ₂ (SO ₄) ₂ ²⁻ , UO ₂ (CO ₃) ₂ ²⁻						■ ³⁾		
ClO ₄ ⁻			■ ³⁾					
NOM						■ ⁵⁾		

1) Regeneration 7.5% HCl, conditioning Ca(OH)₂
2) Regeneration 10% NaCl

3) Single use
4) Regenerated 7% NaCl

5) Regeneration 10% NaOH



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Regulatory Compliance Information:

Some of the end uses of the products described in this publication must comply with applicable regulations, such as the FDA, BfR, NSF, USDA, and CPSC. If you have any questions on the regulatory status of these products, contact your LANXESS Corporation representative, the LANXESS Regulatory Affairs Manager in Pittsburgh, PA or the Health, Safety, Environment and Quality Department (HSEQ) of LANXESS Deutschland GmbH in Germany. The manner in which you use and the purpose to which you put and utilize our products, technical assistance and information (whether verbal, written or by way of production evaluations), including any suggested formulations and recommendations are beyond our control. Therefore, it is imperative that you test our products, technical assistance and information to determine to your own satisfaction whether they are suitable for your intended uses and applications. This application-specific analysis must at least include testing to determine suitability from a technical as well as health, safety, and environmental standpoint. Such testing has not necessarily been done by us. Unless we otherwise agree in writing, all products are sold strictly pursuant to the terms of our standard conditions of sale. All information and technical assistance is given without warranty or guarantee and is subject to change without notice. It is expressly understood and agreed that you assume and hereby expressly release us from all liability, in tort, contract or otherwise, incurred in connection with the use of our products, technical assistance, and information. Any statement or recommendation not contained herein is unauthorized and shall not bind us. Nothing herein shall be construed as a recommendation to use any product in conflict with patents covering any material or its use. No license is implied or in fact granted under the claims of any patent.

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