

QUALITY PURIFIES.

Potable water purification with high-performance products from LANXESS

X Lewatit® X Bayoxide®

QUALITY WORKS.

LANXESS
Energizing Chemistry

ABOUT LANXESS

We are a leading specialty chemicals company based in Cologne, Germany, well established on the global market. Our primary expertise lies in producing, developing, and marketing chemical intermediates, additives, specialty chemicals, and plastics. As a specialist and efficient partner, we offer solutions to all kinds of challenges faced by our customers. We focus on our customers' requirements in order to drive progress and reliably provide innovative product, material, and service solutions. Our manufacturing, administration, and logistics processes are designed for efficiency and performance.

We offer a broad range of technologies and solutions for the treatment of water and other liquid media and are one of the leading manufacturers of ion exchange resins, with production sites in Germany and India. Our **Lewatit®** ion exchange resins and adsorbers are applied in many different industries and applications to treat water and other liquid media.

With our sustainably produced **Lewatit®** Scopeblue ion exchange resins, we offer products that have a carbon footprint that is up to 61 percent smaller than products manufactured from conventional fossil sources and consist of more than 90 percent renewable raw materials. In accordance with the mass balance approach, they are chemically identical to conventional products and are produced in the same plants using the same processes.

In addition, we also offer a range of **Bayoxide®** iron oxide adsorbers for various water treatment applications. Furthermore, our unique calculation and design software **LewaPlus®** is used for modelling and dimensioning of diverse ion exchange systems, including process configurations only available with **Lewatit®** product technology.



High-quality Products

Providing high-quality products is crucial for our business success. Our global production sites are carefully controlled in order to ensure the highest quality possible, no matter where our products are produced.



Reliable Service

We provide a high level of technical expertise and do our best to support you wherever we can. Our global technical sales team will help you find the best product for your needs.



Innovative Solutions

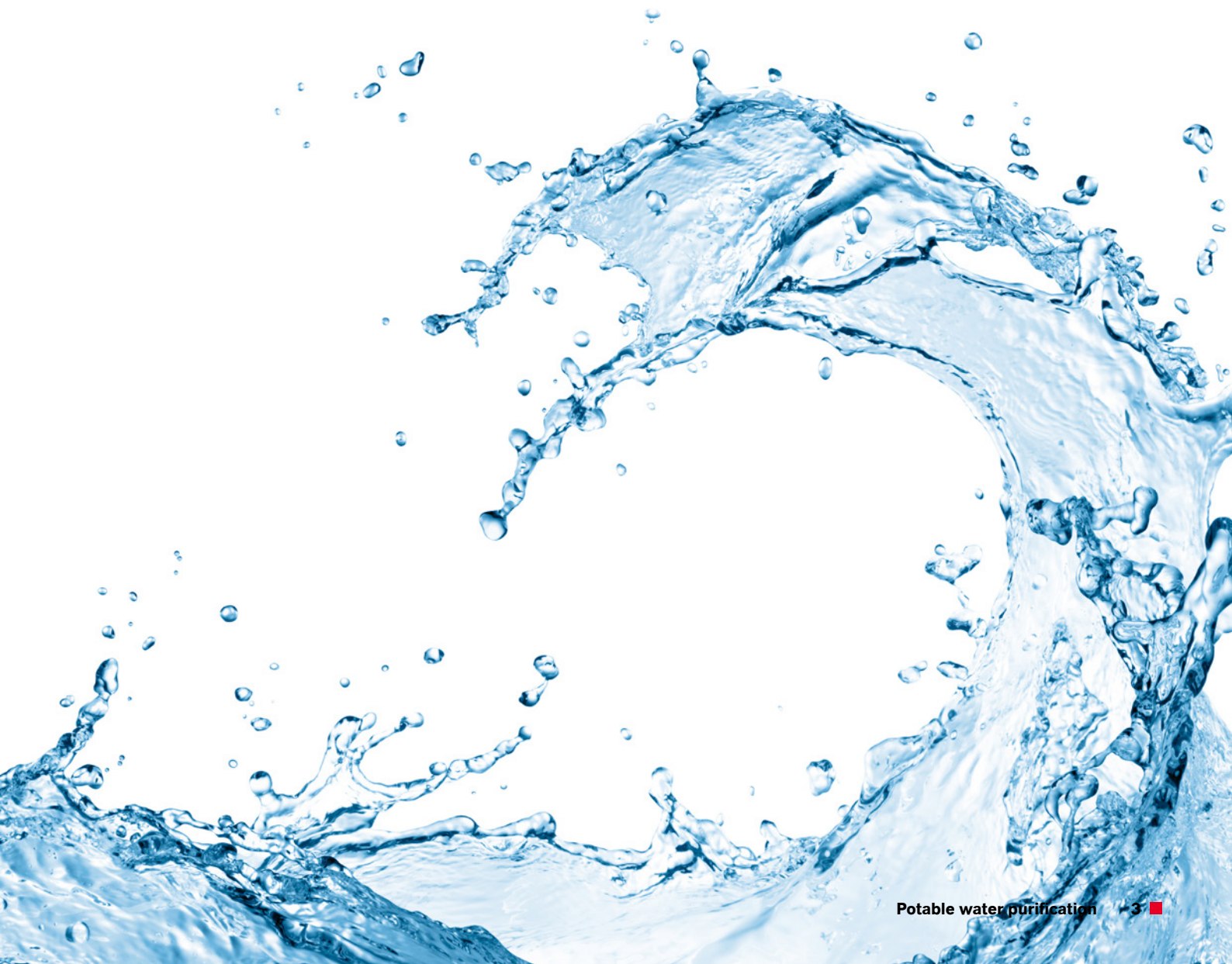
We are continuously investing in research and development in order to optimize our products and discover innovative uses for our ion exchange resins, adsorbers, and iron oxide adsorbers.

TWO 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 due to less frequent regenerations and resin refills. Highly pure water can then be generated in compliance with drinking water standards.

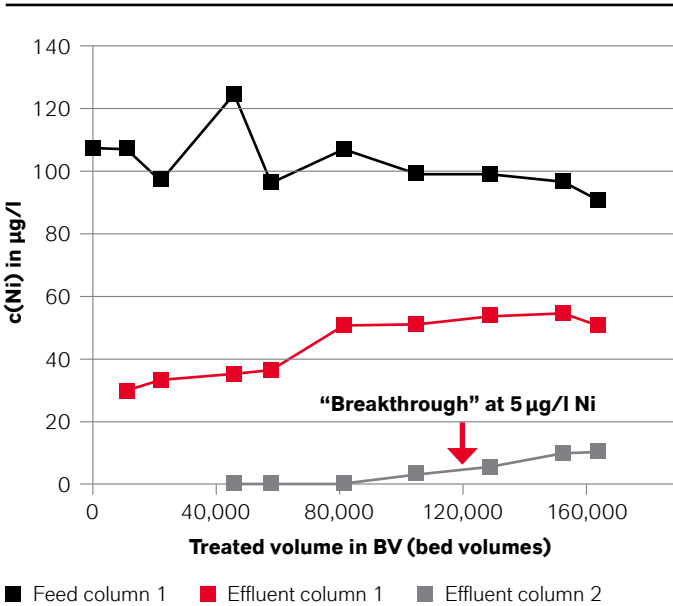


Nickel removal with Lewatit® MonoPlus TP 207

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 (gray)

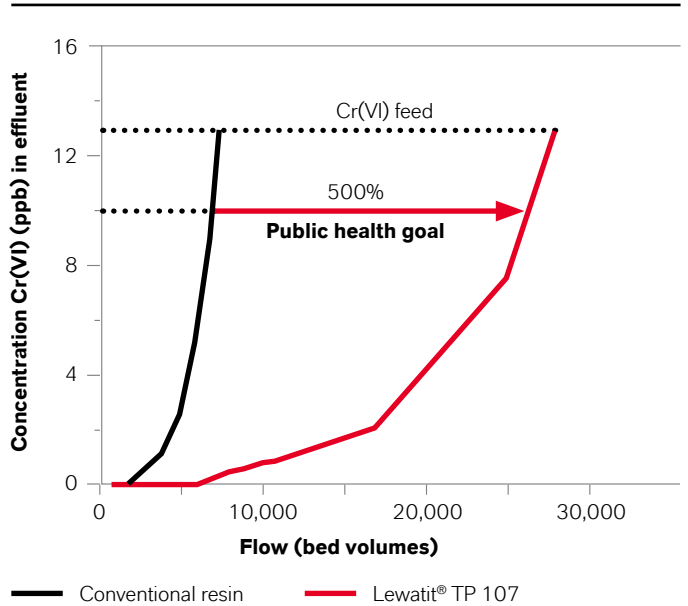


Chromium (VI) contaminated groundwater purification with Lewatit® TP 107

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%.



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
- Depending on the local regulations arsenic exhausted material can be disposed via non-hazardous landfill. Leaching test data are available on request

Arsenic removal with Bayoxide®



Bayoxide® E 33



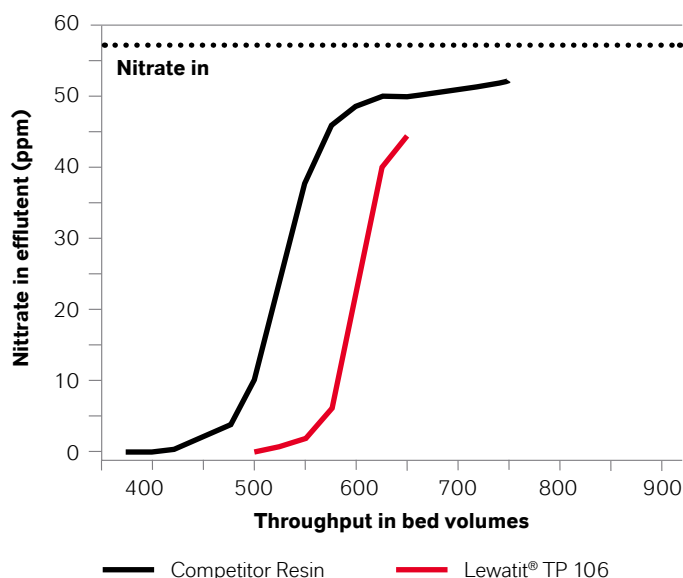
Bayoxide® E 33 HC

Nitrate removal from contaminated groundwater with Lewatit® TP 106

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® TP 106 and a competitor resin: Lewatit® TP 106 shows no nitrate dumping effect.



Feed Solution

NO ₃ ⁻	= 57 mg/L
SO ₄ ²⁻	= 44 mg/L
Cl ⁻	= 60 mg/L
HCO ₃ ⁻	= 7mg/L
pH	= 7.4
Temp.	= 20 °C

Resin shape

Cl	= Cl-form
Specific vel.	= 20
BV/h	= 20 BV/h

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 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



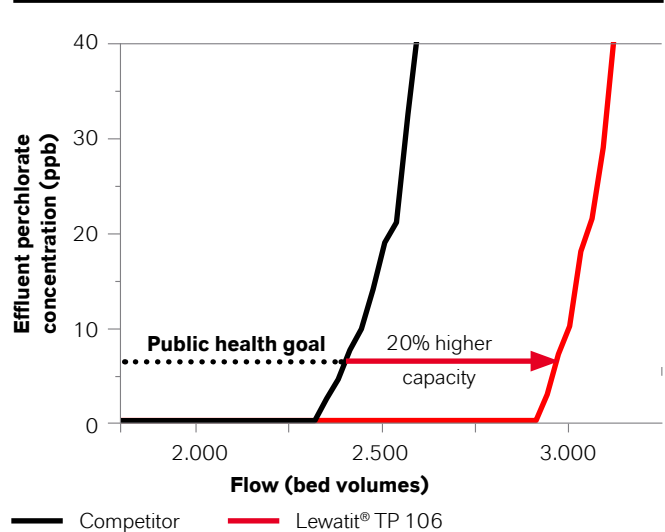
■ Lewatit® DW 630 ion exchange filters removing toxic uranium from water

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 due to less frequent resin re-fills 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: breakthrough curves depicting the concentration of perchlorate determined by ion chromatography in the effluent of the ion exchange column in dependence on the treated water volume.



Feed composition

[ClO₄]⁻ = 20 ppm
 [SO₄²⁻] = 20 ppm
 [Cl]⁻ = 20 ppm
 [NO₃]⁻ = 10 ppm
 pH = 7

Specific flow = 20 BV/h

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

PFAS removal using Lewatit® TP 108 DW

LANXESS has developed a new selective ion exchange resin that reduces PFAS reliably below the drinking water limits and that can safely be disposed after use.

- High PFAS selectivity provides up to 2 times longer cycle time than conventional ion exchange resins and up to 10 times longer than activated carbon
- Long resin lifetime provides savings on capital costs
- High capacity up to 100 g/l even in the presence of background constituents such as chloride and sulfate

- Legal requirements regarding discharge limits are fulfilled
- Special purification procedure provides odorless resin
- NSF/ANSI 61 drinking water certificate available

Breakthrough curves depicting the concentration of perfluoroheptanoic acid (PFHpA, red), perfluorooctanoic acid (PFOA, black) and perfluorononanoic acid (PFNA, grey) in the effluent of the ion exchange column in dependence on the treated water volume.

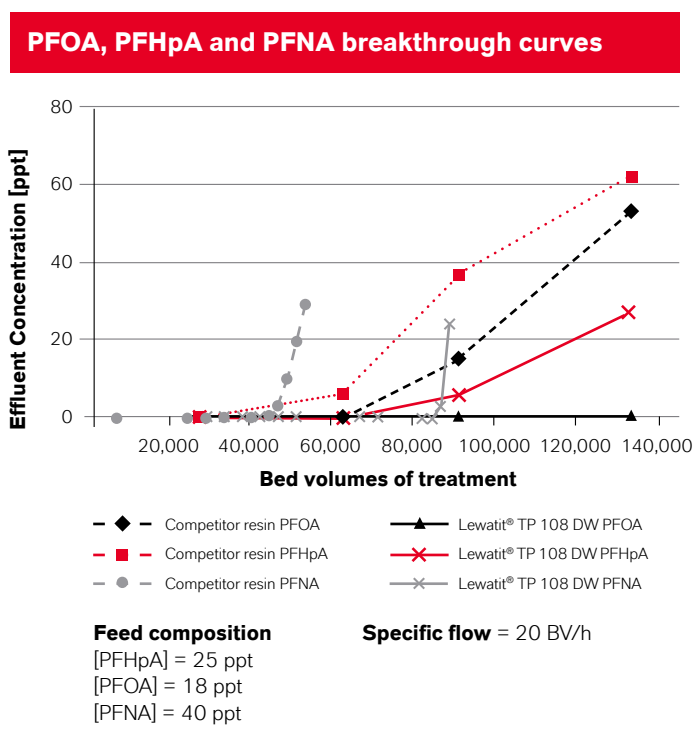


Table 2: Overview of LANXESS products for drinking water applications

Pollutant	Chelate resin	Strong base anion exchange resin (SBA)					Iron hydroxide adsorber	
	Lewatit® TP 207	Lewatit® TP 106	Lewatit® TP 107	Lewatit® TP 108 DW	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⁾			
PFAS				■ ³⁾				

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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Health and Safety Information:

Appropriate literature has been assembled which provides information concerning the health and safety precautions that must be observed when handling the LANXESS products mentioned in this publication. For materials mentioned which are not LANXESS products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be followed. Before working with any of these products, you must read and become familiar with the available information on their hazards, proper use and handling. This cannot be overemphasized. Information is available in several forms, e.g., material safety data sheets, product information and product labels. Consult your LANXESS representative in Germany or contact the Health, Safety, Environment and Quality Department (HSEQ) of LANXESS Germany or - for business in the USA - the LANXESS Product Safety and Regulatory Affairs Department in Pittsburgh, PA.

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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