

# QUALITY TASTES.



Water purification for Point of Use (POU) systems  
with Lewatit® ion exchange resins

**X Lewatit®**

**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. We operate production facilities at our sites in Leverkusen and Bitterfeld, Germany, and in Jhagadia, India.

# PURIFIED WATER WITH POINT OF USE (POU) SYSTEMS FILLED WITH LEWATIT®



Clean and good-tasting potable water is the most essential part of a healthy lifestyle. This reflects the increasing awareness of people around the world as to how to secure a sustainable source for clean water all year round. Governments are focusing on providing safe and clean drinking water, investing in infrastructure in order to cope with improving quality, seeking clean and reliable sources. At the same time, there is an upsurge in demand for purifying systems across households, restaurants and other establishments directly at its point of use (PoU systems) providing both an additional barrier of protection against contaminant intrusion as well as for achieving higher-quality taste. In China alone the annual growth rate between 2019 and 2023 for the total residential water treatment market will be > 18%\*. Improving the quality of life for themselves and their families with pure and delicious water is the major driving force among consumers.

With Lewatit® ion exchange resins LANXESS offers a wide range of products suitable for the softening and dealkalization of potable water in PoU systems (cartridge filter applications). Calcium and magnesium can be removed and also ions that are harmful to human health such as lead and copper, releasing other safe ions in the water instead. Outstanding German product quality, long-established technical experience, production know-how covering more than 80 years, compliance with a great number of regulatory requirements globally and drinking water certification are only a few of the characteristics found with the Lewatit® products. With Lewatit®, not only safe and healthy but pure and delicious potable water can be prepared directly at your home.

\*Source: Verify Markets: China residential water treatment market

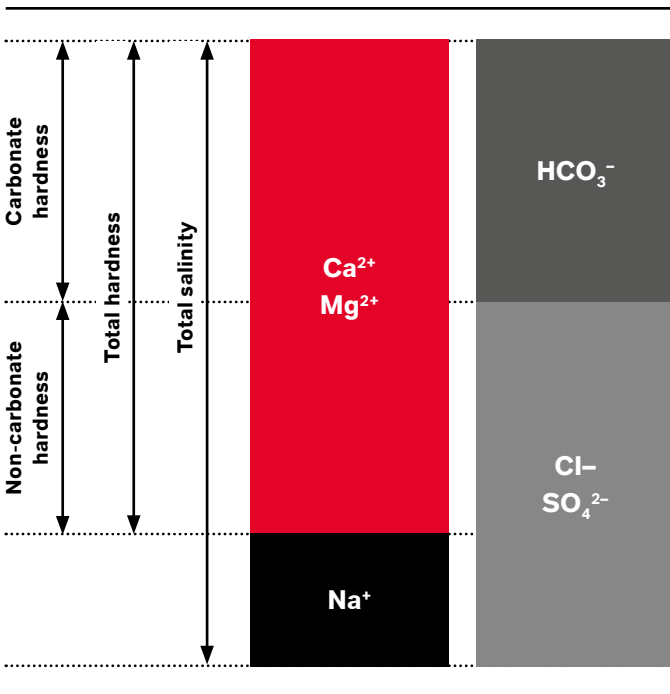


# BASICS OF DRINKING WATER SOFTENING

## How does it work?

The **Lewatit®** products applied in drinking water are mainly weak acidic cation exchangers (WAC). They are predominantly used in cartridges for household water filters and installed in domestic water systems. The WAC resins are able to efficiently exchange divalent cations in water (e.g.,  $\text{Ca}^{2+}$ ) without altering effluent pH. Therefore, WAC resins can remove calcium (carbonate hardness) and magnesium ( $\text{Mg}^{2+}$ ) from water.

**Figure 1: Carbonate and non-carbonate hardness**



Beside the ability to remove the carbonate hardness from water and therefore to improve the taste of drinking water and prevent scaling in water heating systems (coffee machines, boilers), the other outstanding feature of WAC resins is the ability to safely remove divalent heavy metal ions (e.g.,  $\text{Cu}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Pb}^{2+}$ ). In addition, special ion exchangers preloaded with magnesium and/or potassium ions can remineralize the drinking water with minerals that are essential for human vitality and well-being. Thus LANXESS products actively contribute to the safety of drinking water and the health of the consumer by removing harmful contaminants and replacing them with vitally important minerals.

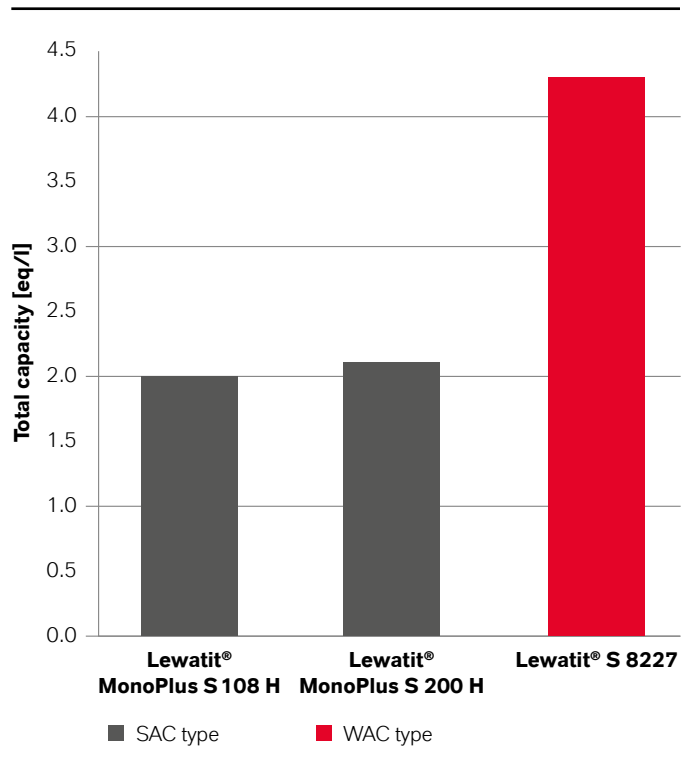
## Why use weak acidic cation exchangers?

In general, two types of ion exchanger are applicable for the removal of undesired cations (like calcium) in water. It is possible to use a strong acidic cation exchanger (SAC) and a weak acidic cation exchanger (WAC). LANXESS has placed special focus on developing WAC technology because this type of ion exchange resin offers some outstanding advantages against conventional SAC resins.

### 1. Higher total capacity

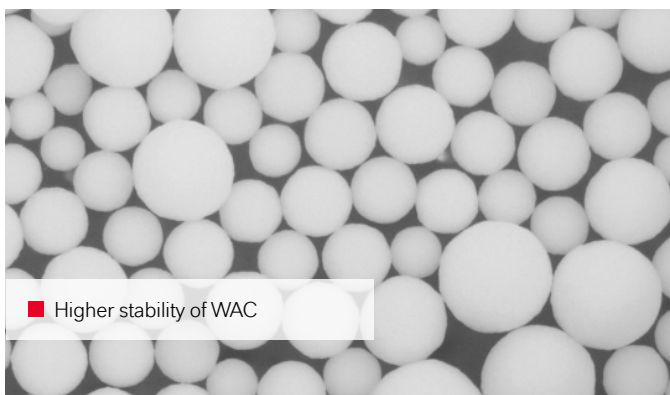
The first of these advantages is the very high total capacity and therefore also the very high operating capacity of the WAC. Standard SAC water products like **Lewatit® MonoPlus S 200 H** and **Lewatit® MonoPlus S 108 H** have a total capacity in the range of 2.0–2.2 eq/l. In comparison WAC resins offer a total capacity in the range of 3.4–4.5 eq/l, so almost double the capacity compared to a strong acidic cation exchange resin.

**Figure 2: Total capacity comparison of WAC and SAC types**



## 2. Mechanical stability

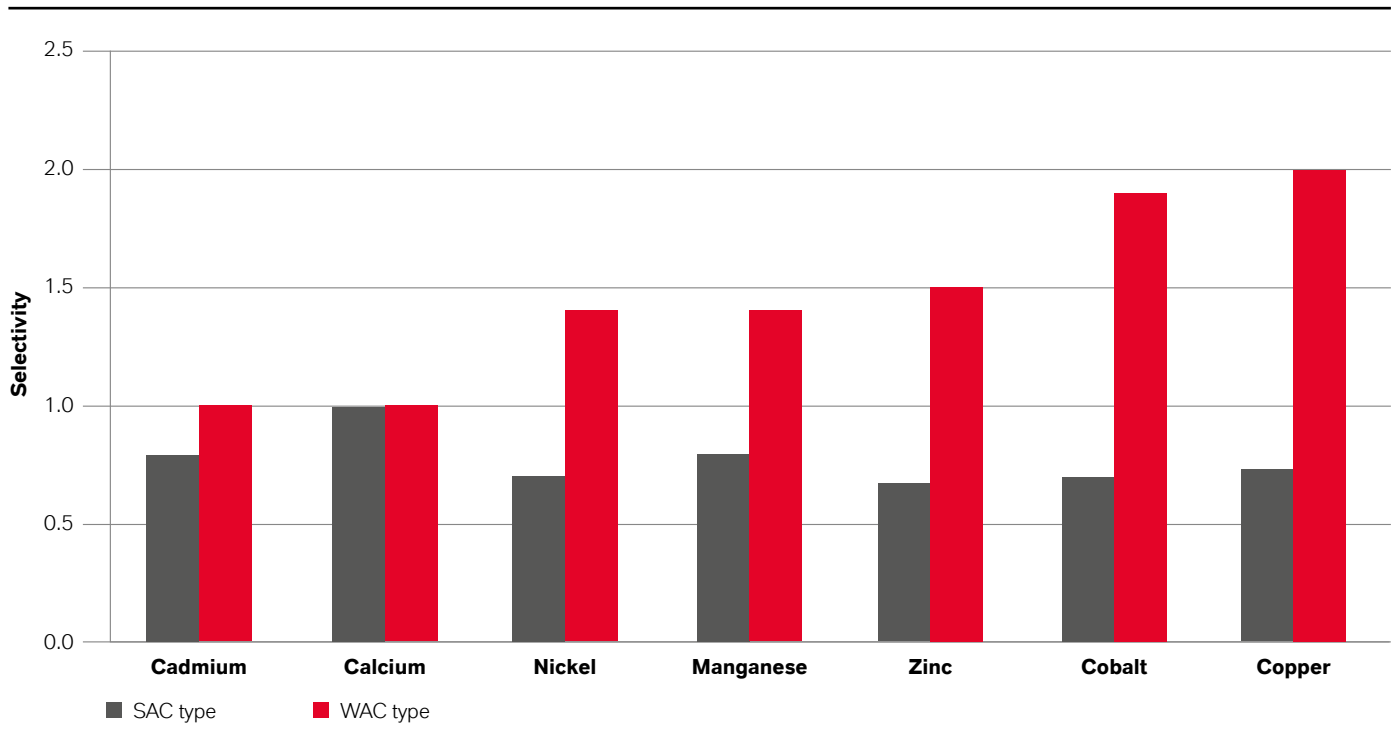
Additionally, the mechanical stability of WAC resins is superior to the stability of SAC resins due to the polyacrylic matrix of the LANXESS WAC resins. This polyacrylic matrix is extremely resistant to osmotic stress (swelling and shrinking) compared to polystyrene SAC resins. The mechanical stability of the resin is a very important factor to guarantee the correct functioning of the filter, since broken beads due to mechanical instability can block the filter.



## 3. High selectivity for divalent cations

WAC resins have a higher affinity/selectivity for divalent cations like cadmium, copper, cobalt, and nickel than SAC resins. This is the reason they can bind these potentially harmful cations at a very high level of efficiency and protect your health by purifying drinking water of these harmful contaminants.

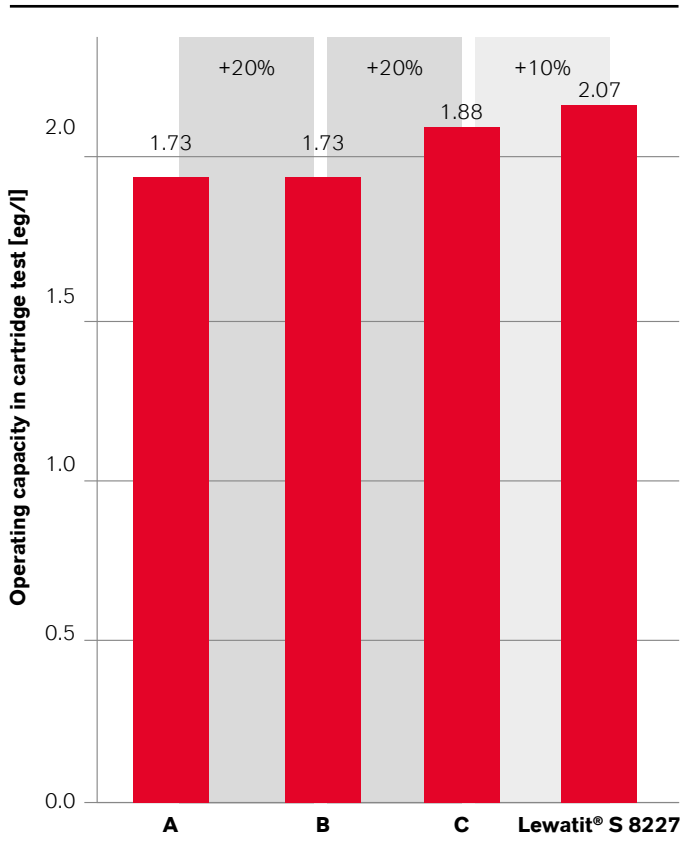
**Figure 3: Selectivity comparison for weak acidic cation exchanger for harmful heavy metals**



# LEWATIT® PERFORMANCE

## Proven premium product quality

**Figure 4: Performance of Lewatit® S 8227 compared with other WACs**



Lewatit® products offer superior performance for the end user. In Figure 4 the performance of the product Lewatit® S 8227 has been compared with different WAC products from competition in a cartridge test. In this test the performance was tested in a standard cartridge with an influent hardness concentration of 4.4 meq/l, which is a typical hardness value for German raw water. It is clear that Lewatit® S 8227 offers superior performance. Therefore a cartridge filled with LANXESS premium WAC products provides a superior filter runtime compared to other products on the market.

## Proven purity and cleanliness

Apart from this very good technical performance, Lewatit® S 8227 offers a unique level of purity in the field of WAC resins. Compared to other available resins for drinking water applications, Lewatit® WAC products are the only resins in the market that offer a pure white color, which emphasizes their high grade of purity.

Due to this high level of purity and incomparable cleanliness, which was developed using more than 80 years of experience in the field of WAC technology, LANXESS products meet the stringent market requirements for both taste and odor.

Therefore, Lewatit® products ensure the full experience of pure genuine water. The purification not only adds to the experience of water, also the taste of tea and coffee can be clearly improved by the purification technology of Lewatit® products.

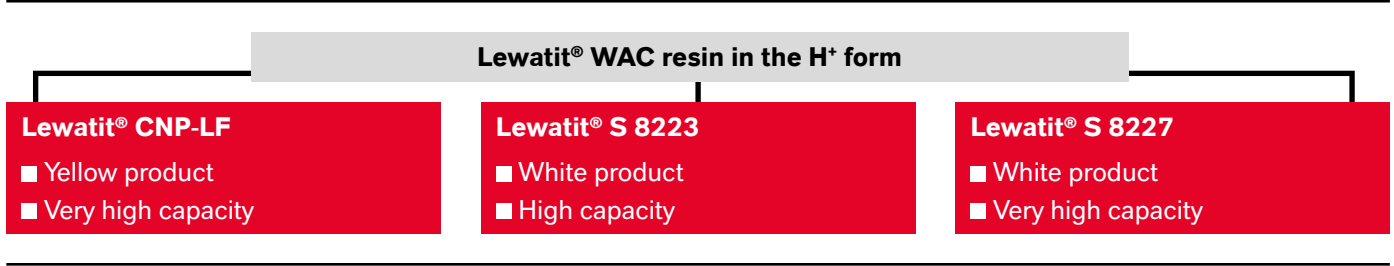


# LEWATIT® – THE IDEAL SOLUTION FOR ANY APPLICATION



The following description gives brief instructions on how to choose the right Lewatit® weak acidic product for a given application. In general, Lewatit® WAC resins are applicable for all types of dealkalization and softening tasks, from small pitcher cartridges to large professional cartridges for use in offices, hotels, catering, gastronomy, vending machines and many more.

The most utilized form of a weak acidic cation exchanger is the H<sup>+</sup> form. In this form, H<sup>+</sup> ions are exchanged with monovalent and divalent cations in the filtered water. This resin type is mostly utilized for pitcher cartridges, where the filtered water is directly consumed by the end user. Heavy metals are removed, as well as temporary hardness in drinking water. Furthermore, resins in other delivery forms, e.g., Na<sup>+</sup> or K<sup>+</sup>, exist.

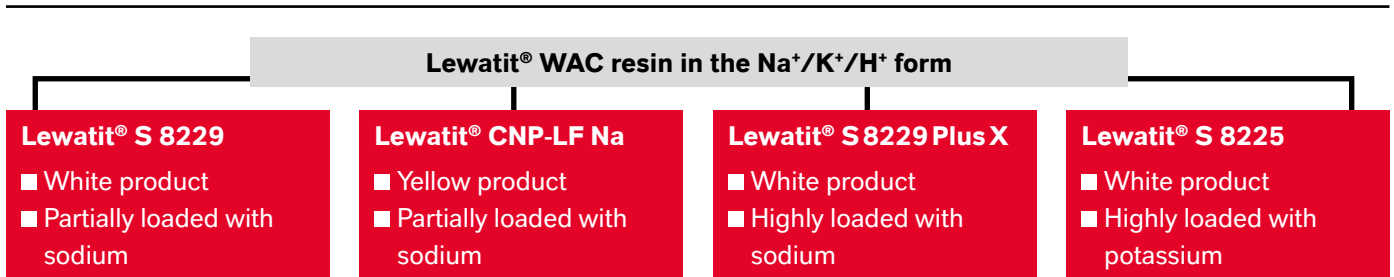


**This resin type is partially loaded with sodium or potassium ions. This loading offers multiple advantages:**

- Potable water is mineralized with the cations preloaded on the resin, especially K<sup>+</sup> is known for positive effects on human health and vitality
- The pH value of the filtered water stays close to neutral due to the release of Na<sup>+</sup>/K<sup>+</sup> instead of H<sup>+</sup> ion, this can be especially relevant when cartridges are used in systems that are sensitive to corrosion
- Heavy metals as well as temporary hardness are removed in potable water

### Lewatit® WAC resin in H<sup>+</sup>/Na<sup>+</sup>/Ag<sup>+</sup> form

Lewatit® S 8229 Plus Ag resin is partly loaded with silver. This offers the advantage that microbiological growth in a filter cartridge can be effectively prevented according to the experience of users of this product. Due to the very high silver content of the resin, it was reported that the addition of only a small amount of Lewatit® S 8229 Plus Ag in a cartridge effectively prevents the growth of bacteria.



# QUALITY MADE IN GERMANY

LANXESS is one of the leading suppliers of ion exchange resins worldwide with three state-of-the-art production facilities; two in Germany (Leverkusen and Bitterfeld) and one in Jhagadia, India; and more than 80 years of production experience.

To meet the rising demand of WAC resins and to raise its profile in this market segment, LANXESS has invested some EUR 10 million in the expansion of its WAC production capacity by around one third. In September 2014, a new production line at the largest site in Leverkusen as well as a cutting-edge food-compatible filling and packing system was put into operation.

The technical aspects of the new production line reflect many years of experience in producing WAC resins. The discontinuous (i.e., batch) production process begins with the creation of polymer beads through emulsion polymerization. A mix-

ture of the two polymer components, the monomer and the cross-linker, is placed in an inert solvent in a “beading tank” to form a finely distributed emulsion. Adhering precisely to the reaction parameters is essential for creating a high-quality product. To maintain a high degree of reproducibility and consistency in quality at this stage, the procedures involved are largely automated.

Sophisticated safety technology ensures that the highly exothermic (heat-generating) reaction takes place safely. If this technology fails, there is also a non-electric safety system in reserve that can stop a reaction fully automatically if it becomes too powerful. In this respect, LANXESS insists not merely on redundancy, but on a third redundant safety system, so that everything is always under full control. Once the monomer has been processed and the reaction comes to an end, the beads are filtered from the liquid reaction medium and assigned to the relevant functional groups.





### Food-compatible filling system

To complement the site's existing filling plant, the capacity expansion also included the construction of a new building for filling products destined for food and drinking water applications. With this food-compatible packaging facility, LANXESS is setting very high standards for product purity and ensuring even better quality. The centerpiece is the "white zone" of the new plant, which was designed according to the "black and white" principle. This principle was originally developed and used in the mining industry and serves to keep clean ("white") and contaminated ("black") work areas separate.

The white zone is supplied with filtered air and is under positive pressure to prevent impurities in the surrounding environment from entering. The specially trained personnel who work there also wear protective clothing.

Inside this hall, which covers some 300 square meters, products are fed from several silos into big bags and drums on stainless steel pallets so that they can immediately be weighed, labeled, and transported. A rail-bound transportation system is used instead of conventional forklifts. Packaging material can be delivered via three truck ramps. Before being transported to the adjoining storage and dispatch building, the containers are transferred fully automatically onto pallets and sealed in weatherproof film. There is an additional buffer storage area next to the workroom.



### Why to choose LANXESS and Lewatit®

- Premium products made in Germany
- To our knowledge Lewatit® are the only white WAC products in the market with no smell or taste
- One of the world's leading suppliers especially for WAC resins
- More than 80 years of production experience for ion exchange resins
- Food-grade packaging facility
- High technical application experience with strong R&D background
- Relevant product certificates and approvals for drinking water applications
- LANXESS is a longtime and established supplier of market-leading cartridge producers worldwide

# CURRENT PORTFOLIO OF LEWATIT®

## WEAK ACIDIC CATION EXCHANGERS

Type		Lewatit® S 8528	Lewatit® S 8223	Lewatit® CNP-LF	Lewatit® CNP-LF Na
<b>Functional group</b>		Carboxylic acid	Carboxylic acid	Carboxylic acid	Carboxylic acid
<b>Color</b>		Yellow	White	Yellow	Yellow
<b>Delivered form</b>		H <sup>+</sup>	H <sup>+</sup>	H <sup>+</sup> /K <sup>+</sup>	H <sup>+</sup> /N <sup>+</sup>
<b>Food approval</b>		FDA FCN 74	New products, application for cer- tificates submitted	New products, application for cer- tificates submitted	New products, ap- plication for certifi- cates submitted
<b>Effective bead size</b>	mm	0.48–0.58	0.45–0.65	0.40–0.70	0.40–0.70
<b>Total capacity (H<sup>+</sup> form)</b>	eq/l	4.3	3.4	4.3	4.3
<b>Bulk density</b>	g/l	750	740	approx. 820	approx. 820
<b>Water retention (delivery form)</b>	%	43–48	53–63	approx. 58–63	approx. 46–50
<b>Temperature stability</b>		High	Moderate	Moderate	Moderate
<b>Application advice</b>		For the use in cartridges additional mixing with active carbon is mandatory			
<b>Typical application</b>		Cartridge	Cartridge	Cartridge	Cartridge



Lewatit® S 8227	Lewatit® S 8229	Lewatit® S 8229 Plus X	Lewatit® S 8229 Plus Ag
Carboxylic acid	Carboxylic acid	Carboxylic acid	Carboxylic acid
White	White	White	White
H <sup>+</sup>	H <sup>+</sup> /Na <sup>+</sup>	H <sup>+</sup> /Na <sup>+</sup>	H <sup>+</sup> /Na <sup>+</sup> /Ag <sup>+</sup>
WRAS BS 6920 NSF/ANSI 61 France	WRAS BS 6920 NSF/ANSI 61 France	NSF/ANSI 61	NSF/ANSI 61
0.46–0.56	0.46–0.56	0.48–0.64	0.48–0.64
4.3	4.3	4.3	4.3
770	770	820	790
47–53	47–53	58–63	58–64
Moderate	Moderate	Moderate	Moderate
For the use in cartridges additional application of active carbon is advisable			
Cartridge	Cartridge	Cartridge	Cartridge





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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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