

QUALITY PURIFIES.



Lewatit® ion exchange resins
and adsorbents for capture and
purification of biomolecules

X Lewatit®

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 67 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.

SPECIFIC SOLUTIONS FOR PHARMACEUTICAL AND BIOPROCESSING INDUSTRIES

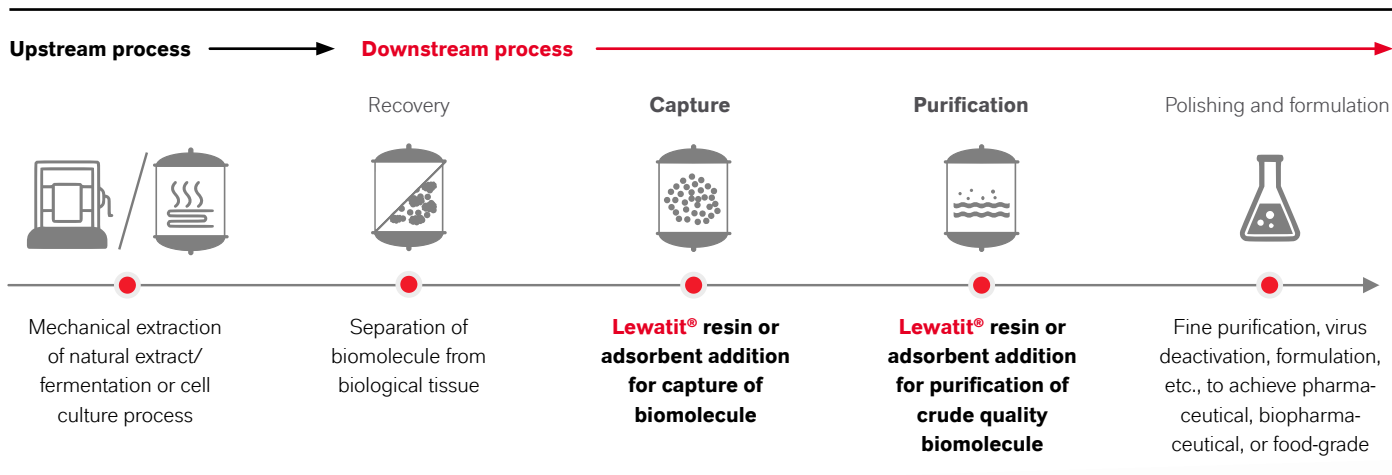
The production of biomolecules deriving from natural extracts and bioprocessing fermentation processes is strongly supported by a wide range of Lewatit® ion exchange and adsorbent resins. This resin technology opens up a variety of capture and purification options for all kinds of operation scales. Our Lewatit® products are specifically designed to be used in downstream (post-fermentation) processing of various biomolecules, including products from animal- and plant-sourced natural extracts. All resins are based on hydrophobic (polystyrene-divinylbenzene) or medium hydrophilic (polyacrylic) matrices and are specifically designed to meet the highest demands for downstream processing support

required for industries such as bioprocessing and biotechnology, pharmaceutical, biopharmaceutical, nutraceutical, and food.

Capture and purification of biomolecules such as peptides, antibiotics, vitamins, amino acids, and polysaccharides is based on classical ion exchange or adsorption processes, enabling, e.g., detoxification, conversion, decolorization, and demineralization of biomolecules.

A classical downstream post-fermentation approach including resin support is shown in scheme 1.

Scheme 1: Efficient capture and purification of biomolecules is driven by Lewatit® resins and adsorbents.



Ion exchange resins and adsorbents are used in various pharmaceutical and bioprocessing applications to support the manufacturing of all kinds of biomolecules via their capture and purification. Table 1 gives an overview of Lewatit® resins used in biomolecule production processes.

Classically, resins are utilized in either the capture of biomolecules by isolating them from complex mixtures, or the separation of biomolecules via capture and selective elution, or the purification of biomolecules via, e.g., demineralization or decolorization, or the stabilization of biomolecules via neutralization or conversion.

Table 1: Examples of pharmaceutical and biotechnological applications using Lewatit® products.

Biomolecule	SAC								WAC		SBA		WBA		Adsorber	Carrier
	Lewatit® PH 1061	Lewatit® PH 1061 MDS	Lewatit® PH 1062 MDS	Lewatit® PH 2061	Lewatit® SC 104 PH	Lewatit® SP 120	Lewatit® LGP 3789 FK	Lewatit® LGP 5392 PH	Lewatit® PH 8021	Lewatit® MonoPlus TP 207	Lewatit® PH 1074 HEP	Lewatit® PH 7061	Lewatit® PH 3021	Lewatit® PH 5021	Lewatit® VP OC 1064 MD PH	Lewatit® VP OC 1600
Antibiotic	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Amino acid	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Botanical extract	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Animal extract	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Vitamin	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Peptide	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Polysaccharide	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

■ Use of ion exchange resin and adsorbents is state-of-the-art technology
 ■ Use of ion exchange resin and adsorbents is recommended



Antibiotics

Antibiotics are derived from fermentation or chemical synthesis. Lewatit® resins and adsorbents are utilized during capture and purification, e.g., within cephalosporin, streptomycin, gentamicin, neomycin, erythromycin, and vancomycin production. Supported processes are various, ranging from isolation (e.g., Lewatit® VP OC 1064 MD PH, Lewatit® PH 8021), decolorization (e.g., Lewatit® PH 7061), conversion (e.g., Lewatit® 1061, Lewatit® 7061), demineralization, and polishing (e.g., Lewatit® PH 3021).



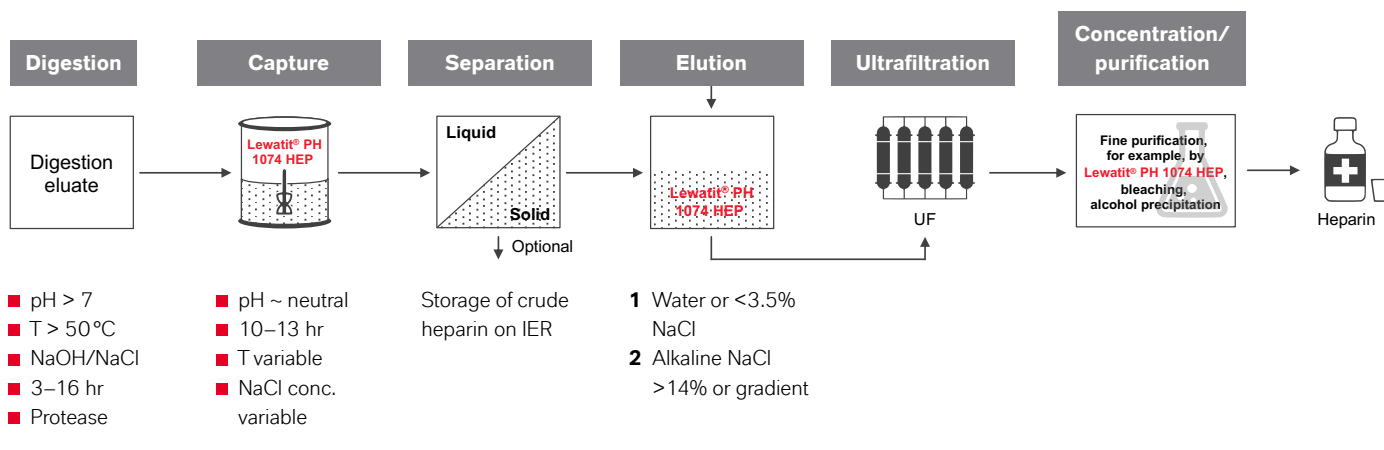
Amino acids

Amino acids are the building blocks of proteins and play a key role in the existence of living organisms. They are produced in bioreactors via the bacterial fermentation of carbohydrates. Industrial purification of most types of amino acids often involves ion exchange resins and adsorbents steps. They can be separated from each other using strong acidic cation exchange resins (e.g., Lewatit® PH 2061 MDS), captured from a complex fermentation broth mixture by separation from non-ionic impurities (e.g., Lewatit® PH 1061, Lewatit® PH 5021) and decolorized (Lewatit® VP OC 1064 MD PH). Selection of resin types is based on the type and charge of amino acid. Lewatit® supports the production of amino acids, ranging from BCAAs (branched-chain amino acids) to unbranched ones, such as lysin, threonine, tryptophan, histidine, arginine, serine, and many more.

Polysaccharides

A large selection of marketed pharmaceuticals is based on polysaccharides and derived either from fermentation processes or natural extracts. One well-known product class originating from animal sources is GAGs (glycosylated amino glycans), such as heparin, chondroitin, nadroparin, dermatan, and others. Their capture and purification is typically done with ion exchange resins (Lewatit® PH 1074 HEP) to allow the high yield, activity, and purity of end products (Scheme 2). An important feature of resin involves a specially designed macroporous structure to allow the best conditions for adsorption and desorption. Lewatit® PH 1074 HEP is added to the digestion mixture, takes up the GAG, and is finally separated from solution. Afterwards, the elution of, e.g., heparin, from ion exchange resins is done with brine.

Scheme 2: Purification steps of GAGs, such as heparin, by capture and elution using Lewatit® PH 1074 HEP



PRODUCT PORTFOLIO

Table 2: A diversified strong portfolio of Lewatit® solutions for biomolecules production

Lewatit®	Product matrix	Type	Group	TC ¹	Bead size ²
LGP 3789 FK	Styrene/DVB, macro	SAC	-SO ₃ ⁻ H ⁺	1.0	HD, share 0.1–0.5
LGP 5392 PH	Styrene/DVB, macro	SAC	-SO ₃ ⁻ H ⁺	1.7	HD, share 0.32–0.42
PH 1061 MDS	Styrene/DVB, gel	SAC	-SO ₃ ⁻ K ⁺	1.5 (H)	MD, d50 0.25–0.31
PH 1062 MDS	Styrene/DVB, gel	SAC	-SO ₃ ⁻ Na ⁺	1.6 (H)	MD, d50 0.25–0.31
PH 1061	Styrene/DVB, gel	SAC	-SO ₃ ⁻ Na ⁺	2.2	MD, d50 0.57–0.67
PH 2061	Styrene/DVB, macro	SAC	-SO ₃ ⁻ Na ⁺	1.7	MD, d50 0.60–0.70
SC 104 PH	Styrene/DVB, gel	SAC	-SO ₃ ⁻ H ⁺	1.2	HD, d10 0.50–0.62
SP 120	Styrene/DVB, macro	SAC	-SO ₃ ⁻ Na ⁺	1.4	HD, d10 0.42–0.58
MonoPlus TP 207	Styrene/DVB, macro	WAC	-N(CH ₂ CO ₂ ⁻ Na ⁺) ₂	2.0 (H)	MD, d50 0.56–0.66
PH 8021	Polyacrylate, macro	WAC	-CO ₂ H	4.3	HD, d10 0.48–0.58
PH 1074 HEP	Polyacrylate, macro	SBA	-N(CH ₃) ₃ ⁺ Cl ⁻	0.7	HD, d10 0.50–0.65
PH 7061	Styrene/DVB, macro	SBA	-N ⁺ (CH ₃)Cl ⁻	1.0	MD, d50 0.57–0.67
PH 3021	Styrene/DVB, macro	WBA	-N(CH ₃) ₂	1.7	HD, d10 0.50–0.60
PH 5021	Polyacrylate, macro	WBA	-N(C ₂ H ₄ NH ₂) ₂	3.4	HD, d10 ≥ 0.4
VP OC 1064 MD PH	Styrene/DVB, macro	ADS	None	BET 800 m ² /g	MD, d50 0.44–0.54
VP OC 1600	Styrene/DVB, macro	CAR	None	–	HD, d10 0.32–0.45

Note:

[1] TC = total capacity (delivery form) in min. eq/L

[2] MD = monodisperse with mean bead size d50. HD = heterodisperse with effective size d10 or share of >90 vol% in mm.

Please refer to technical product data sheet for complete and updated information.

OUTSTANDING FEATURES

With ion exchange resin competency since 1936, our technical experts and global sales force can support you concerning any process or product task that arises. Benefits of Lewatit® products include good chemical and mechanical bead stabilities, excellent kinetics and selectivities, high capacities, and good economics due to lean design and high performance. Our unique monodisperse production technology, offering narrow bead-size distribution, is used for a wide variety of Lewatit® ion exchange resins and adsorbents for the capture and purification of biomolecules.

An additional feature is provided for strong acidic cation exchange resins, which are produced by a 1,2-dichloroethane-free production process, thus delivering a more sustainable solution.

Specific products, such as Lewatit® PH 3021 and Lewatit® MonoPlus TP 207, are produced via a unique phthalimide production chemistry, achieving full substitution control and true weak-base resins.

LANXESS is a globally leading manufacturer of ion exchange, catalyst, adsorbent, and specialty resins, with global headquarters in Cologne, Germany. All manufacturing sites are routinely audited. Our in-house regulatory compliance experts for TSCA, REACH, etc., are available for immediate and the very best support. High product quality is ensured by the strict quality control of each single manufactured batch before its release to shipment, accompanied by a certificate of analysis for each production lot. Based on customer requirements, exclusive sampling support is offered for the introduction of Lewatit® products into your process.

Our biopharmaceutical-grade Lewatit® ion exchange resins and adsorbents are compliant with the following certificates and statements:

- Non-GMO
- TSE/BSE
- Allergens
- Heavy metals
- Halal
- Kosher
- EU regulation No 1935/2004 of the European Parliament and the Council of the European Union on materials and articles intended to come into contact with food
- Council of Europe Resolution ResAP(2004)3 on ion exchange and adsorbent resins used in the processing of foodstuffs
- EU regulation No 2023/2006 on good manufacturing practice for materials and articles intended to come into contact with food
- ISO 9001:2015 Quality Management System specifications
- ISO 14001:2015 Environmental Management System requirements
- Please inform technical sales person in case FDA compliance is intended to apply.

Ion exchange resins that meet corresponding contact requirements with regard to their composition must be pretreated by the user in accordance with the manufacturer's instructions to comply with the extraction limits described in the associated regulations.



All complete and updated information including technical product data sheets, pretreatment recommendations, certificates, and statements are available for download on our website.

<https://lanxess.com/en/Products-and-Solutions/Brands/Lewatit>

Note: Lewatit® PH 5021 and Lewatit® MonoPlus TP 207 are provided with a batch-related manufacturer's declaration



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Contact: Questions regarding our products and their use are welcome at any time. Please contact our sales representative in your country. All contact details can be found on <https://lewatit.com/>

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