

QUALITY PURIFIES.



Start-up Conditions for **Lewatit®** ion exchange resins and adsorbents for capture and purification of biomolecules

X Lewatit®

QUALITY **WORKS.**

LANXESS
Energizing Chemistry

In the food, bioprocessing, and biopharmaceutical industry, high demands are placed on products that come into contact with the end products. 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. In this brochure, the start-up conditions are described according to the resin type and area of application, in order to meet the manufacturer's declarations drawn up by LANXESS on the use of **Lewatit®** ion exchange resins in the food, bioprocessing, and biopharmaceutical sector.



Recommended specifications for regeneration chemicals of **Lewatit®** ion exchange resins

Appearance	Sodium chloride	Hydrochloric acid	Sulfuric acid	Sodium hydroxide
Conc. NaCl	>97%			
Conc. HCl		>30%		
Conc. H ₂ SO ₄			>93%	
CO ₃ ²⁻ content				<0.2% (2,000 ppm)
Cl ⁻ content				<0.2% (2,000 ppm)
SO ₄ ²⁻ content	<1% (10,000 ppm)	<0.5% (5,000 ppm)		<0.1% (1,000 ppm)
SiO ₂ content				<0.004% (40 ppm)
Alkaline earth content (Ca ²⁺)	<0.4% (4,000 ppm) WS <100 ppm*			<0.01% (100 ppm)
Iron content (Fe ³⁺)	0.001% (10 ppm)	<0.002% (20 ppm)	<0.002% (20 ppm)	<0.001% (10 ppm)
Aluminum content (Al ³⁺)				<0.001% (10 ppm)
Mercury content (Hg ²⁺)				<0.001% (2 ppm)
Acid consumption (pH 8.2)	None			
Organochlorines		<0.02 g/l (approx. 17 ppm)	Nil	
Oxidants		<4 ppm Cl ₂	<12 ppm Cl ₂	<10 ppm O ₂

* For the counter current regeneration process, when the lowest hardness leakage is required.

These specifications are based on DIN 19604, DIN 19610, and DIN 19615. The concentrations are expressed in % or in ppm, based on the weight of reagent of 100%.

RECOMMENDED START-UP PROCEDURE

Strong and weak acid cation resin types used in their hydrogen form

Standard regeneration

Hydrochloric acid/sulfuric acid

Form supplied

Sodium, hydrogen

Resin types

Lewatit® PH 1061

Lewatit® PH 2061

Lewatit® PH 8021

Lewatit® SC 104 PH

Lewatit® SP 120

Lewatit® LGP 3789 FK

Lewatit® LGP 5392 PH

Procedure

- 1** The resin should be transferred to the column and soaked in demineralized, soft, or drinking water for approximately 1 hour.
- 2** Backwash the resin for at least 30 minutes.
- 3** Let the resin bed settle and then drain to within 10 cm of the top of the bed.
- 4** Let 4 bed volumes of hydrochloric or sulfuric acid solution (6% HCl or H₂SO₄) pass through the column at a rate of 2 bed volumes per hour.
- 5** Rinse the resin with at least 4 bed volumes of demineralized water at a flow rate of 2 bed volumes per hour.
- 6** Let 4 bed volumes of caustic soda solution (4% NaOH) pass through the column at a rate of 2 bed volumes per hour.
- 7** Rinse the resin with at least 4 bed volumes of demineralized water at a flow rate of 2 bed volumes per hour.
- 8** Let 4 bed volumes of hydrochloric or sulfuric acid solution (6% HCl or H₂SO₄) pass through the column at a rate of 2 bed volumes per hour.
- 9** Rinse the resin with at least 5 bed volumes of demineralized water at a flow rate of 2 bed volumes per hour.
- 10** Take the resin into service.

Strong and weak anion resin types used in their hydroxide form

Standard regeneration

Caustic soda

Form supplied

Chloride, free base

Resin types

Lewatit® PH 7061

Lewatit® PH 3021

Lewatit® PH 5021

Procedure

- 1** The resin should be transferred to the column and soaked in demineralized, soft, or drinking water for approximately 1 hour.
- 2** Backwash the resin for at least 30 minutes.
- 3** Let the resin bed settle and then drain to within 10 cm of the top of the bed.
- 4** Let 4 bed volumes of caustic soda solution (4% NaOH) pass through the column at a rate of 2 bed volumes per hour.
- 5** Rinse the resin with at least 4 bed volumes of demineralized water at a flow rate of 2 bed volumes per hour.
- 6** Let 4 bed volumes of hydrochloric or sulfuric acid solution (6% HCl or H₂SO₄) pass through the column at a rate of 2 bed volumes per hour.
- 7** Rinse the resin with at least 4 bed volumes of demineralized water at a flow rate of 2 bed volumes per hour.
- 8** Let 4 bed volumes of caustic soda solution (4% NaOH) pass through the column at a rate of 2 bed volumes per hour.
- 9** Rinse the resin with at least 5 bed volumes of demineralized water at a flow rate of 2 bed volumes per hour.
- 10** Take the resin into service.

Strong anion resin used in its chloride form

Standard regeneration

Brine/alkalized brine solution

Form supplied

Chloride

Resin types

Lewatit® PH 1074 HEP

Adsorbent and carrier resin types

Standard regeneration

Caustic soda

Ethanol

Form supplied

Nonfunctional

Resin types

Lewatit® VP OC 1064 MD PH

Lewatit® VP OC 1600

Procedure

- 1 The resin should be transferred to the column and soaked in demineralized, soft or drinking water for approximately one hour.
- 2 Backwash the resin at least 30 minutes.
- 3 Let the resin bed settle and then drain to within 10 cm of the top of the bed.
- 4 Let 3-4 bed volumes of alkalinized brine solution (10% NaCl/ 1% NaOH) pass through the column at a rate of 2 bed volumes per hour.
- 5 Displace the elution solution with 1.5 bed volumes of demineralized or soft water at a rate of 2 bed volumes per hour.
- 6 Rinse the resin with at least 5 bed volumes of demineralized or soft water at a flow rate of 2-5 bed volumes per hour.
- 7 Take the resin into service.

Procedure

- 1 The resin should be transferred to the column and soaked in demineralized, soft, or drinking water for approximately 1 hour.
- 2 Backwash the resin for at least 30 minutes.
- 3 Let the resin bed settle and then drain to within 10 cm of the top of the bed.
- 4 Let 2 bed volumes of caustic soda solution (4% NaOH) pass through the column at a rate of 2 bed volumes per hour.
- 5 Rinse the resin with at least 4 bed volumes of demineralized water at a flow rate of 2 bed volumes per hour.
- 6 Let 0.5 bed volumes of hydrochloric or sulfuric acid solution (0.5% HCl or H₂SO₄) pass through the column at a rate of 2 bed volumes per hour.
- 7 Rinse the resin with at least 4 bed volumes of demineralized water at a flow rate of 2 bed volumes per hour.
- 8 Take the resin into service.

Alternative regeneration with ethanol **1 – 3 as above**

- 4 Let 2 bed volumes of ethanol (50–96%) pass through the column at a rate of 2 bed volumes per hour.
- 5 Rinse the resin with at least 4 bed volumes of demineralized water at a flow rate of 2 bed volumes per hour.
- 6 Take the resin into service.

Strong acid cation chromatography resin types used in their hydrogen form

Standard regeneration

Hydrochloric acid

Form supplied

Sodium, calcium, potassium

Resin types

Lewatit® PH 1061 MDS

Lewatit® PH 1062 MDS

Strong acid cation chromatography resin types used in their required salt form

Standard regeneration

Hydrochloric acid/sulfuric acid, salt/base for conversion

Form supplied

Sodium, calcium, potassium

Resin types

Lewatit® PH 1061 MDS

Lewatit® PH 1062 MDS

Procedure

- 1 The resin should be transferred to the column and soaked in demineralized, soft, or drinking water for approximately 1 hour.
- 2 Backwash the resin for at least 30 minutes.
- 3 Let the resin bed settle and then drain to within 10 cm of the top of the bed.
- 4 Let 4 bed volumes of hydrochloric or sulfuric acid solution (6% HCl) pass through the column at a rate of 2 bed volumes per hour.
- 5 Rinse the resin with at least 4 bed volumes of demineralized water at a flow rate of 2 bed volumes per hour.
- 6 Let 4 bed volumes of caustic soda solution (4% NaOH) pass through the column at a rate of 2 bed volumes per hour.
- 7 Rinse the resin with at least 4 bed volumes of demineralized water at a flow rate of 2 bed volumes per hour.
- 8 Let 4 bed volumes of hydrochloric or sulfuric acid solution (6% HCl) pass through the column at a rate of 2 bed volumes per hour.
- 9 Rinse the resin with at least 5 bed volumes of demineralized water at a flow rate of 2 bed volumes per hour.
- 10 Take the resin into service.

Procedure

- 1 The resin should be transferred to the column and soaked in demineralized, soft, or drinking water for approximately 1 hour.
- 2 Backwash the resin for at least 30 minutes.
- 3 Let the resin bed settle and then drain to within 10 cm of the top of the bed.
- 4 Let 4 bed volumes of hydrochloric acid solution (10–15% HCl) pass through the column within 1–2 hours.
- 5 Rinse the resin with demineralized water until pH is ≥ 4.5 .
- 6 Let a calculated amount of salt/base solution pass through the column at a rate of 2 bed volumes per hour.
- 8 Rinse the resin with at least 10 bed volumes of demineralized water or until conductivity is lower than $50 \mu\text{S}$ at a flow rate of 2 bed volumes per hour.
- 9 Take the resin into service.

Salt/base for conversion

Ionic form to be converted	Recommended form to use for conversion	Molecular weight (g/mol)	Equivalent weight (g/mol)	Amount of equivalents in 1 l of a 10% dilution	Amount of 10% dilution to convert properly*	Amount of equivalents in 1 l of a 20% dilution	Amount of 20% dilution to convert properly*
Na	NaCl	58.4	58.4	1.71	3.50	3.42	1.75
Na	NaOH	40	40	2.50	2.40	5.00	1.20
K	KCl	74.5	74.5	1.34	4.47	2.68	2.24
K	KOH	56.1	56.1	1.78	3.37	3.57	1.68
Ca	CaCl ₂	111.0	55.5	1.80	3.33	3.60	1.67
Mg	MgCl ₂	95.2	95.2	1.05	5.71	2.10	2.86
Mg	MgSO ₄	120.4	60.2	1.66	3.61	3.32	1.81
NH ₄	NH ₄ Cl	53.5	53.5	1.87	3.21	3.74	1.61
NH ₄	NH ₄ OH	35.0	35.0	2.86	2.10	5.71	1.05
Sr	SrCl ₂	158.5	79.3	1.26	4.76	2.52	2.38

* 3 times excess at a total capacity of 2.0 eq/l resin

Chelating weak acid cation resin type used in their hydrogen form

Standard regeneration

Hydrochloric acid/sulfuric acid

Form supplied

Disodium

Resin type

Lewatit® MonoPlus TP 207

Procedure

- 1** The resin should be transferred to the column and soaked in demineralized, soft, or drinking water for approximately 1 hour.
- 2** Backwash the resin for at least 30 minutes.
- 3** Let the resin bed settle and then drain to within 10 cm of the top of the bed.
- 4** Let 2.5 bed volumes of hydrochloric or sulfuric acid solution (7.5% HCl or 10% H₂SO₄) pass through the column at a rate of 4 bed volumes per hour.
- 5** Rinse the resin with at least 4 bed volumes of demineralized water at a flow rate of 4 bed volumes per hour.
- 6** Let 2.5 bed volumes of caustic soda solution (4% NaOH) pass through the column in upflow mode at a rate of 4 bed volumes per hour.
- 7** Rinse the resin with at least 4 bed volumes of demineralized water at a flow rate of 4 bed volumes per hour.
- 8** Let 2.5 bed volumes of hydrochloric or sulfuric acid solution (7.5% HCl or 10% H₂SO₄) pass through the column at a rate of 4 bed volumes per hour.
- 9** Rinse the resin with at least 4 bed volumes of demineralized water at a flow rate of 4 bed volumes per hour.
- 10** Take the resin into service.
- 11 a Disodium form:** Let 2.5 bed volumes of caustic soda solution (4% NaOH) pass through the column in upflow mode at a rate of 4 bed volumes per hour.
- 11 b Monosodium form:** Let 1–1.2 bed volumes of caustic soda solution (4% NaOH) pass through the column in downflow mode at a rate of 4 bed volumes per hour. Backwash the resin for 10 minutes to mix resin properly.
- 12** Rinse the resin with at least 4 bed volumes of demineralized water at a flow rate of 4 bed volumes per hour.
- 13** Take the resin into service.

Optional

In case resin is applied in its mono- or Disodium form some additional steps follow.



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