Bio-Works

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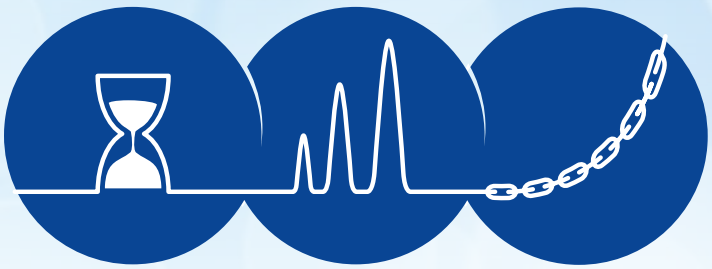


Bio-Works products

Research & Laboratory | Process Development | Bioprocess Production

Content

Introduction to Bio-Works

Uppsala, Sweden

Bio-Works is located at Uppsala Business Park site in Sweden. The company designs, develops, manufactures and supplies innovative leading edge products for purification and separation of peptides, proteins, oligonucleotides, viruses and other biomolecules for uses in research, process development and manufacturing in Life Science & Biopharma.

Bio-Works agarose based chromatography resins are manufactured using a proprietary method that results in porous beads with a tight size distribution and very high mechanical stability. Agarose based matrices have been successfully used for decades in biotechnology, from research to manufacturing scale purifications, due to its exceptional compatibility with biomolecules including proteins, peptides, and nucleic acids. Our company's WorkBeads resins are designed for separations that require optimal capacity, purity, productivity and reproducible scale-up results.

Experience and Quality

Bio-Works is highly experienced in the development and manufacturing of separation resins, and very knowledgeable about separation applications. The experience in our team covers the successful founding and growth of start-up companies, global and regional management within multinational companies, and the successful development, launch, and marketing of leading edge technologies.

The company is certified by Intertek and follows ISO 9001:2015.

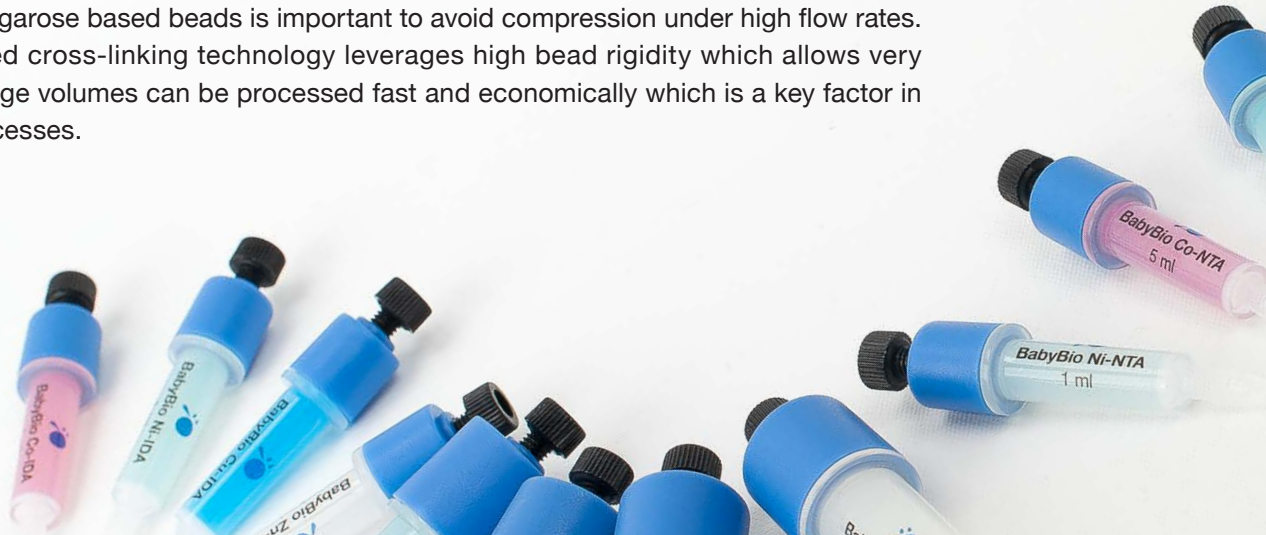
Bio-Works supplies product information, quality documents, technical support, certificates, statements, vendor audits and regulatory support information.

Bio-Works believes in sustainability and care about the environment.

Technologies

Agar used as the starting material for WorkBeads resins is an inert, versatile and readily available natural material isolated from seaweed. It is the leading material used for purification matrices in protein science and biopharmaceutical processing. It will not denature or in any other way harm the delicate biotechnology products that are purified. Specialist knowledge is required to produce beads with suitable size, rigidity and porosity and then further to derivatize and make surface modifications for optimal final products.

The rigidity of the agarose based beads is important to avoid compression under high flow rates. Bio-Works patented cross-linking technology leverages high bead rigidity which allows very high flow rates. Large volumes can be processed fast and economically which is a key factor in manufacturing processes.



Products

Bio-Works advanced agarose based products are designed for purification of monoclonal and polyclonal antibodies, recombinant and native proteins, peptides, oligonucleotides, viruses, vaccines, enzymes, dairy proteins and for optimized purification of His-tagged proteins.

Bio-Works optimized WorkBeads resins are produced in several different bead sizes and porosities for both preparative research and bioprocess manufacturing scales. This allows seamless scalability and reproducible results. The bulk resins are available in pack sizes from 1.5 ml to 10 L and larger volumes on request.

The ready-to-use prepacked BabyBio columns (1 ml and 5 ml) and prepacked OptioBio 10x100 (7.9 ml) glass columns are designed for rapid, convenient and reproducible selectivity screenings and small scale purifications.

Several products are available for coupling of specific custom designed resins, for polishing of the target product in the final step, as well as, for very fast conditioning of the target product to prevent degradation.

Long term commitment

Bio-Works experience in agarose chemistry and long-term commitment ensures secured supply of products and continuous development of new chemistries, matrices and formats for future launches of high quality products for research, process development and manufacturing.

Our production and R&D departments are located in the same facility, this enables us to offer high flexibility and great technical service. In other words, we have the capacity and knowledge to develop and manufacture a large range of products optimized for many different application areas.

Bio-Works production meets your needs today and in the future. Our ambition is to make purification simple.

Application areas

Target molecule – how to start?

Antibodies

WorkBeads affimAb

- Top performance dynamic binding capacity also at short residence time
- Outstanding alkaline stability with 0.5 M NaOH
- WorkBeads 40 TREN for removing host cell proteins and extending the lifetime of the protein A resin

His-tagged proteins

Wide range of IMAC resins

- WorkBeads NiMAC with extra strongly bound Ni^{2+} resulting in extremely low nickel ion leakage, withstands 20 mM DTT and 20 mM EDTA
- Precharged and uncharged IMAC resins
- High selectivity, purity and yield
- NTA and IDA chelating ligands

Peptides

WorkBeads 40S and WorkBeads 40Q

- Higher dynamic binding capacity than other supplier's products
- Eliminates impurities prior to a polishing step, reducing bioburden on for example high-resolution silica resins
- BabyBio Peptide Purification Kit for fast and easy optimization

Oligonucleotides

WorkBeads 40Q

- Higher dynamic binding capacity compared to other supplier's products
- High purity when using standard low-pressure columns
- Applicable in large-scale industrial purification

Viruses and vaccines

WorkBeads 40/10 000 SEC

- WorkBeads 40S, WorkBeads 40Q and WorkBeads 40 TREN
- Purification of virus-like particles and virus components

Proteins & enzymes

WorkBeads 40S, WorkBeads 40Q and WorkBeads 40 TREN

- From capture to polishing
- Lower pressure with efficient purification
- High dynamic binding capacities at short residence times
- BabyBio IEX Screening Kit incl. four different 1 ml columns for fast and easy screening for running conditions and selectivity

BabyBio Screening Kits

BabyBio ready-to-use 1 ml and 5 ml columns are prepacked with most of Bio-Works' different resins. The column is made from biocompatible polypropylene which does not significantly interact with biomolecules. The top and bottom filters are made from polyethylene.

BabyBio Screening Kits are products for fast and easy screening of optimal selectivity and to find optimal running conditions in a reliable and convenient way.

Depending on purification scale when the optimal resin has been found for the specific target it is easy to continue using individual BabyBio columns or use buk resin and pack a larger column.

BabyBio NTA His-tag Screening kits

Includes one 1 ml or one 5 ml of each: BabyBio Ni-NTA, BabyBio Co-NTA, BabyBio Cu-NTA and BabyBio Co-NTA.

- Easy screening for optimized purity of His-tagged proteins
- Prepacked with WorkBeads 40 Ni-NTA, WorkBeads 40 Co-NTA, WorkBeads 40 Cu-NTA and WorkBeads 40 Zn-NTA

BabyBio IDA His-tag Screening kits

Includes one 1 ml or one 5 ml of each: BabyBio Ni-IDA, BabyBio Co-IDA, BabyBio Cu-IDA and BabyBio Zn-IDA.

- Easy screening for optimized purity of His-tagged proteins
- Prepacked with WorkBeads 40 Ni-IDA,WorkBeads 40 Co-IDA, WorkBeads 40 Cu-IDA and WorkBeads 40 Zn-IDA

BabyBio IEX Screening kit

Includes one 1 ml of each: BabyBio S, BabyBio Q, BabyBio DEAE and BabyBio TREN.

- Easy screening for optimal running conditions and selectivity
- Prepacked with WorkBeads 40S, WorkBeads 40Q, WorkBeads 40 DEAE and WorkBeads 40 TREN
- High binding capacity even at high flow rates
- Small-scale IEX purifications

BabyBio Peptide Purification Kit

Includes one 1 ml of each: BabyBio S and BabyBio Q

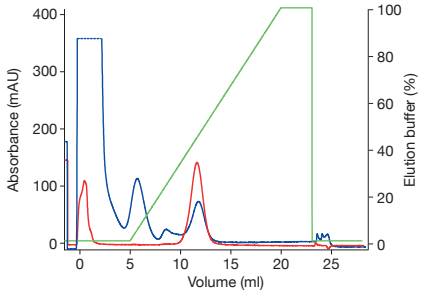
- Fast screening for optimal peptide purifications
- Prepacked with WorkBeads 40S and WorkBeads 40Q
- Easy screening for optimal running conditions
- High binding capacity even at high flow rates

Applications

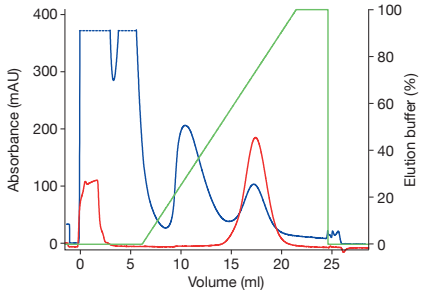
Using BabyBio NTA His-tag Screening kit and BabyBio IDA His-tag Screening to find the optimal purification method

Sample:	2 ml His_6-GFP in binding buffer
Columns:	BabyBio Ni-NTA, BabyBio Co-NTA, BabyBio Zn-NTA, BabyBio Cu-NTA BabyBio Ni-IDA, BabyBio Co-IDA, BabyBio Zn-IDA, BabyBio Cu-IDA
Column volume:	1 ml
Binding buffer:	50 mM sodium phosphate, 300 mM NaCl, 10 mM imidazole, pH 8.0
Elution buffer:	50 mM sodium phosphate, 300 mM NaCl, 300 mM imidazole, pH 8.0
Gradient:	0 to 100% elution buffer in 15 column volumes (CV)
Flow rate:	0.5 ml/min (75 cm/h)

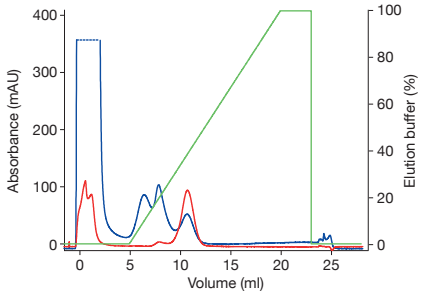
BabyBio Ni-NTA 1 ml



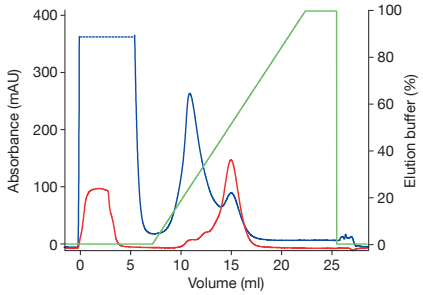
BabyBio Ni-IDA 1 ml



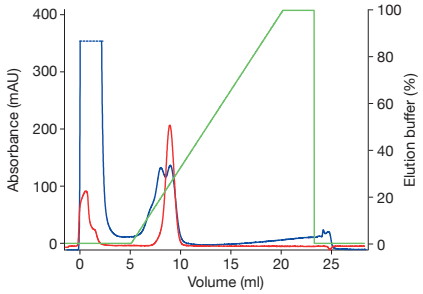
BabyBio Co-NTA 1 ml



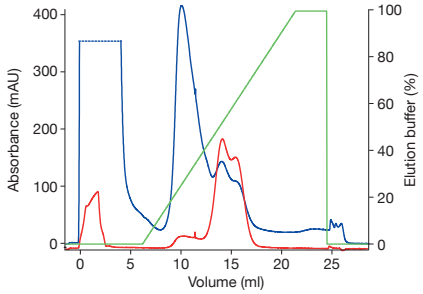
BabyBio Co-IDA 1 ml



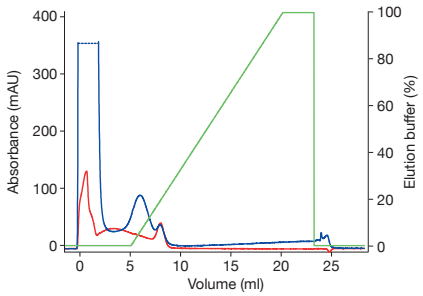
BabyBio Cu-NTA 1 ml



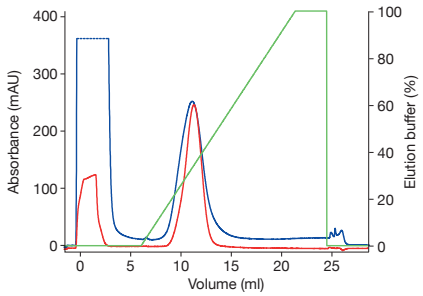
BabyBio Cu-IDA 1 ml



BabyBio Zn-NTA 1 ml



BabyBio Zn-IDA 1 ml



Chromatograms showing comparisons of purifications of clarified His_6-GFP on BabyBio NTA 1 ml and BabyBio IDA 1 ml charged with Ni^{2+}, Co^{2+}, Cu^{2+} and Zn^{2+} ions. The blue and red lines correspond to the absorbance signal at 280 nm and 490 nm (specific for GFP), respectively, and the green line to the percentage of elution buffer.

Technical specifications

BabyBio NTA His-tag Screening kits and BabyBio IDA His-tag Screening kits

	BabyBio NTA His-tag Screening kit	BabyBio IDA His-tag Screening kit
Resin	WorkBeads 40 Ni-NTA, WorkBeads 40 Co-NTA WorkBeads 40 Cu-NTA, WorkBeads 40 Zn-NTA	WorkBeads 40 Ni-IDA, WorkBeads 40 Co-IDA WorkBeads 40 Cu-IDA, WorkBeads 40 Zn-IDA
Matrix	Rigid, highly cross-linked agarose	Rigid, highly cross-linked agarose
Average particle size[1] (D_{v50})	45 µm	45 µm
Ligand	Nitrilotriacetic acid (NTA)	Iminodiacetic acid (IDA)
Metal ion	Ni^{2+}, Co^{2+}, Cu^{2+} or Zn^{2+}	Ni^{2+}, Co^{2+}, Cu^{2+} or Zn^{2+}
Static binding capacity[2]	70 mg His-tagged protein/ml resin	N/A
Dynamic binding capacity[2] (DBC)	50 mg His-tagged protein/ml resin	N/A
Column volume	1 and 5 ml	1 and 5 ml
Column dimension	7 × 28 mm (1 ml), 13 × 38 mm (5 ml)	7 × 28 mm (1 ml), 13 × 38 mm (5 ml)
Recommended flow rates[3] BabyBio 1 ml BabyBio 5 ml	 0.25 to 1 ml/min (37 to 150 cm/h) 1.25 to 5 ml/min (56 to 225 cm/h)	 0.25 to 1 ml/min (37 to 150 cm/h) 1.25 to 5 ml/min (56 to 225 cm/h)
Maximum flow rate[4] BabyBio 1 ml BabyBio 5 ml	 5 ml/min (780 cm/h) 20 ml/min (900 cm/h)	 5 ml/min (780 cm/h) 20 ml/min (900 cm/h)
Maximum back pressure	0.3 MPa, 3 bar, 43 psi	0.3 MPa, 3 bar, 43 psi
Chemical stability	Compatible with all standard aqueous buffers used for protein purifications, 8 M urea, 6 M guanidine-HCl, non-ionic detergents, 20% ethanol. Chelating substances (e.g. EDTA) will strip off the metal ions. Stripped resin: 10 mM HCl (pH 2), 10 mM NaOH (pH 12), 100 mM sodium citrate-HCl (pH 3).	
pH stability	7 to 9 (working) 2 to 12 (cleaning, stripped resin)	7 to 9 (working) 2 to 12 (cleaning, stripped resin)
Storage	2 to 25°C in 20% ethanol	2 to 25°C in 20% ethanol

[1] *The median particle size of the cumulative volume distribution.*
[2] *The binding capacity is determined using a BabyBio Ni-NTA 1 ml. The binding capacity is dependent on the size of the target protein, and on the competition with impurities.*
[3] *Optimal flow rate during binding is depending on the sample. During column wash and elution, a flow rate of 1 ml/min and 5 ml/min can be used for 1 ml and 5 ml columns, respectively. Note: The maximum pressure the packed bed can withstand depends on the sample/liquid viscosity and chromatography resin characteristics. The pressure also depends on the tubing used to connect the column and the system restrictions after the column outlet.*
[4] *Aqueous buffers at 20°C. Decrease the maximum flow rate if the liquid has a higher viscosity. Higher viscosities can be caused by low temperature (use half of the maximum flow rate at 4°C), or by additives (e.g., use half of the maximum flow rate for 20% ethanol).*

BabyBio Peptide Purification kit

	BabyBio S	BabyBio Q
Target substance	Proteins, peptides	Protein, peptides, oligonucleotides, viruses
Resin	WorkBeads 40S	WorkBeads 40Q
Matrix	Rigid, highly cross-linked agarose	Rigid, highly cross-linked agarose
Average particle size1 (D_{v50})	45 µm	45 µm
Ligand	Sulfonate ($-SO_3^-$)	Quaternary amine ($-N^+(CH_3)_3$)
Ion capacity	180 to 250 µmol H+/ml resin	180 to 250 µmol Cl-/ml resin
Dynamic binding capacity	130 mg BSA/ml resin[2]	50 mg BSA/ml resin[3]
Column volume	1 ml and 5 ml	1 ml and 5 ml
Column dimension	7 × 28 mm (1 ml), 13 × 38 mm (5 ml)	7 × 28 mm (1 ml), 13 × 38 mm (5 ml)
Recommended flow rate[4] BabyBio 1 ml BabyBio 5 ml	 0.25 to 1 ml/min (37 to 150 cm/h) 1.25 to 5 ml/min (56 to 225 cm/h)	 0.25 to 1 ml/min (37 to 150 cm/h) 1.25 to 5 ml/min (56 to 225 cm/h)
Maximum flow rate[5] BabyBio 1 ml BabyBio 5 ml	 5 ml/min (780 cm/h) 20 ml/min (900 cm/h)	 5 ml/min (780 cm/h) 20 ml/min (900 cm/h)
Maximum back pressure	0.3 MPa, 3 bar, 43 psi	0.3 MPa, 3 bar, 43 psi
Chemical stability	Compatible with all standard aqueous buffers used for protein purification. 1 M NaOH, 30% isopropanol and 70% ethanol. Should not be stored at low pH for prolonged time.	
pH stability	2 to 13	2 to 13
Storage	2 to 25°C in 20% ethanol with 0.2 M sodium acetate	2 to 25°C in 20% ethanol

[1] *The median particle size of the cumulative volume distribution.*
[2] *Dynamic binding capacity determined at 4 minutes residence time (0.25 ml/min in 1 ml column) in 20 mM sodium citrate, 60 mM NaCl, pH 4.0.*
[3] *Dynamic binding capacity determined at 4 minutes residence time (0.25 ml/min in 1 ml column) in 50 mM Tris-HCl, pH 8.0.*
[4] *Optimal flow rate during binding is depending on the sample. During column wash and elution, a flow rate of 1 ml/min and 5 ml/min can be used for 1 ml and 5 ml columns, respectively. Note: The maximum pressure the packed bed can withstand depends on the sample/liquid viscosity and chromatography resin characteristics. The pressure also depends on the tubing used to connect the column and the system restrictions after the column outlet.*
[5] *Maximum flow rate for aqueous buffers at 20°C. Decrease the maximum flow rate if the liquid has a higher viscosity. Higher viscosities can be caused by low temperature (use half of the maximum flow rate for 20% ethanol).*

BabyBio IEX Screening kit

	BabyBio S	BabyBio Q	BabyBio DEAE	BabyBio TREN
Target substance	Proteins, peptides	Protein, peptides, oligonucleotides, viruses	Protein, peptides, oligonucleotides	Proteins, peptides, oligonucleotides, viruses, chromatin fragments
Resin	WorkBeads 40S	WorkBeads 40Q	WorkBeads 40 DEAE	WorkBeads 40 TREN
Matrix	Rigid, highly cross-linked agarose			
Average particle size1 (D_{V50})	45 µm	45 µm	45 µm	45 µm
Ligand	Sulfonate ($-SO_3^-$)	Quaternary amine ($-N^+(CH_3)_3$)	Diethylaminoethyl ($-CH_2CH_2N^+H(CH_2CH_3)_2$)	Tris(2-aminoethyl) amine (TAEA)
Dynamic binding capacity	130 mg BSA/ml resin[2]	50 mg BSA/ml resin[3]	40 mg BSA/ml resin[3]	50 mg BSA/ml resin[4]
Column volume	1 ml and 5 ml	1 ml and 5 ml	1 ml and 5 ml	1 ml and 5 ml
Column dimension	7 × 28 mm (1 ml) 13 × 38 mm (5 ml)	7 × 28 mm (1 ml) 13 × 38 mm (5 ml)	7 × 28 mm (1 ml) 13 × 38 mm (5 ml)	7 × 28 mm (1 ml) 13 × 38 mm (5 ml)
Recommended flow rate[5]				
BabyBio 1 ml	0.25 to 1 ml/min (37 to 150 cm/h)	0.25 to 1 ml/min (37 to 150 cm/h)	0.25 to 1 ml/min (37 to 150 cm/h)	0.25 to 1 ml/min (37 to 150 cm/h)
BabyBio 5 ml	1.25 to 5 ml/min (56 to 225 cm/h)	1.25 to 5 ml/min (56 to 225 cm/h)	1.25 to 5 ml/min (56 to 225 cm/h)	1.25 to 5 ml/min (56 to 225 cm/h)
Maximum flow rate[6]				
BabyBio 1 ml	5 ml/min (780 cm/h)	5 ml/min (780 cm/h)	5 ml/min (780 cm/h)	5 ml/min (780 cm/h)
BabyBio 5 ml	20 ml/min (900 cm/h)	20 ml/min (900 cm/h)	20 ml/min (900 cm/h)	20 ml/min (900 cm/h)
Maximum back pressure	0.3 MPa, 3 bar, 43 psi	0.3 MPa, 3 bar, 43 psi	0.3 MPa, 3 bar, 43 psi	0.3 MPa, 3 bar, 43 psi
Chemical stability	Compatible with all standard aqueous buffers used for protein purification. 1 M NaOH, 30% isopropanol and 70% ethanol. Should not be stored at low pH for prolonged time.			
pH stability	2 to 13	2 to 13	3 to 9 (rec. pH) 3 to 13	2 to 13
Storage	2 to 25°C in 20% ethanol with 0.2 M sodium acetate	2 to 25°C in 20% ethanol	2 to 25°C in 20% ethanol	2 to 25°C in 20% ethanol

1 *The median particle size of the cumulative volume distribution.*

2 *Dynamic binding capacity determined at 4 minutes residence time (0.25 ml/min in 1 ml column) in 20 mM sodium citrate, 60 mM NaCl, pH 4.0.*

3 *Dynamic binding capacity determined at 4 minutes residence time (0.25 ml/min in 1 ml column) in 50 mM Tris-HCl, pH 8.0.*

4 *Dynamic binding capacity determined at 4 minutes residence time (0.25 ml/min in 1 ml column) in 50 mM Tris-HCl, 50 mM NaCl, pH 8.0.*

5 *Optimal flow rate during binding is depending on the sample. During column wash and elution, a flow rate of 1 ml/min and 5 ml/min can be used for 1 ml and 5 ml columns, respectively. Note: The maximum pressure the packed bed can withstand depends on the sample/liquid viscosity and chromatography resin characteristics. The pressure also depends on the tubing used to connect the column and the system restrictions after the column outlet.*

6 *Maximum flow rate for aqueous buffers at 20°C. Decrease the maximum flow rate if the liquid has a higher viscosity. Higher viscosities can be caused by low temperature (use half of the maximum flow rate for 20% ethanol).*

Ordering information

Product name	Pack size	Article number
BabyBio NTA His-tag Screening kit 1 ml[1]	1 ml × 4	45 700 101
BabyBio NTA His-tag Screening kit 5 ml[1]	5 ml × 4	45 700 102
BabyBio IDA His-tag Screening kit 1 ml[1]	1 ml × 4	45 700 001
BabyBio IDA His-tag Screening kit 5 ml[1]	5 ml × 4	45 700 002
BabyBio IEX Screening Kit[2]	1 ml × 4	45 900 001
BabyBio Peptide Purification Kit[3]	1 ml × 2	45 300 102

[1] *Includes one column each charged with Ni^{2+}, Co^{2+}, Cu^{2+} or Zn^{2+}.*
[2] *Includes one 1 ml column of each: BabyBio S, BabyBio Q, BabyBio DEAE, BabyBio TREN.*
[3] *Bundle of: BabyBio S 1 ml × 1 and BabyBio Q 1 ml × 1.*

More information

Data Sheet, DS 40 650 010

WorkBeads 40 Ni-NTA, WorkBeads 40 Co-NTA,
WorkBeads 40 Zn-NTA, WorkBeads 40 Cu-NTA

WorkBeads 40 Ni-IDA, WorkBeads 40 Co-IDA,
WorkBeads 40 Zn-IDA, WorkBeads 40 Cu-IDA

BabyBio Ni-NTA, BabyBio Co-NTA,
BabyBio Zn-NTA, BabyBio Cu-NTA

BabyBio Ni-IDA, BabyBio Co-IDA,
BabyBio Zn-IDA, BabyBio Cu-IDA

BabyBio NTA His-tag Screening kit
BabyBio IDA His-tag Screening kit

www.bio-works.com/product/imac-resin

Data Sheet, DS 40 100 010

WorkBeads 40S, WorkBeads 40Q, WorkBeads 40 DEAE

BabyBio S, BabyBio Q, BabyBio DEAE, BabyBio TREN,
BabyBio IEX Screening Kit, BabyBio Peptide Purification Kit

www.bio-works.com/product/iex-resin

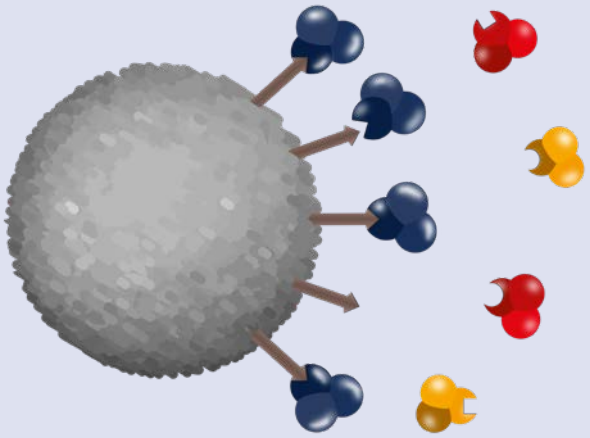

BabyBio Ni-NTA
5 ml
BabyBio Co-NTA
5 ml
BabyBio Cu-NTA
5 ml

Affinity chromatography

Affinity chromatography (AC) separates proteins on the basis of a reversible interaction between a protein (or group of proteins) and a specific ligand coupled to a chromatography matrix. The technique is ideal for the capture step in a purification protocol. The target protein is collected in a highly pure and concentrated form. The high selectivity of affinity chromatography enables many purifications to be achieved in only one simple step, for example, purification of antibodies.

Target molecules

Monoclonal and polyclonal antibodies, bound via the Fc-region



Schematic depicting affinity chromatography

WorkBeads affimAb

- Top performance dynamic binding capacity also at short residence time
- Outstanding alkaline stability with 0.5 M NaOH, extends the number of purification cycles
- Excellent purity, recovery and reproducibility
- Negligible protein A leakage
- Convenient prepacked 1 ml and 5 ml BabyBio columns

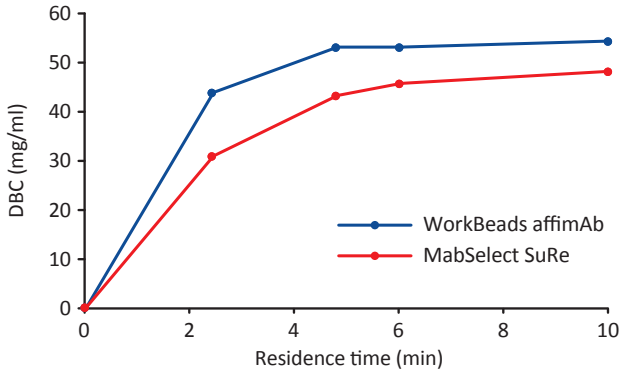
WorkBeads Protein A

- For routine purification of antibodies in the research lab
- High dynamic binding capacity with excellent recovery and purity
- Reliable, reproducible and efficient
- Convenient prepacked 1 ml and 5 ml BabyBio columns

Applications

Dynamic binding capacity *vs* residence time

Resins:	WorkBeads affimAb MabSelect SuRe™ (Cytiva)
Column volume:	3.4 ml (6.6 × 100 mm)
Sample:	1 mg/ml human polyclonal IgG in PBS, pH 7.4
Binding buffer:	PBS, pH 7.4
Elution buffer:	0.1 M glycine-HCl, pH 2.7
Cleaning-in-place (CIP):	5 column volumes (CV) 0.5 M NaOH at 2.4 min residence time (RT)
Residence times:	2.4, 4.8, 6 and 10 min (250, 125, 100 and 60 cm/h)



Alkaline stability comparison

Resins:	WorkBeads affimAb MabSelect SuRe
Column volume:	3.4 ml (6.6 × 100 mm)

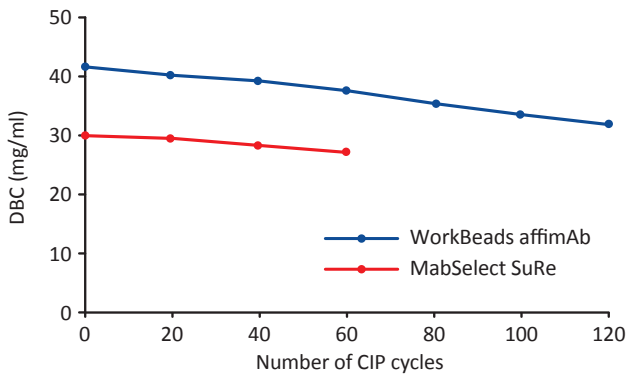
DBC (10% breakthrough) determined at start and after each 20th CIP cycle

Sample:	1 mg/ml human polyclonal IgG in PBS, pH 7.4
Flow rate:	1.4 ml/min (2.4 min RT)
Binding buffer:	PBS, pH 7.4
Elution buffer:	0.1 M glycine-HCl, pH 2.7

Each CIP cycle:

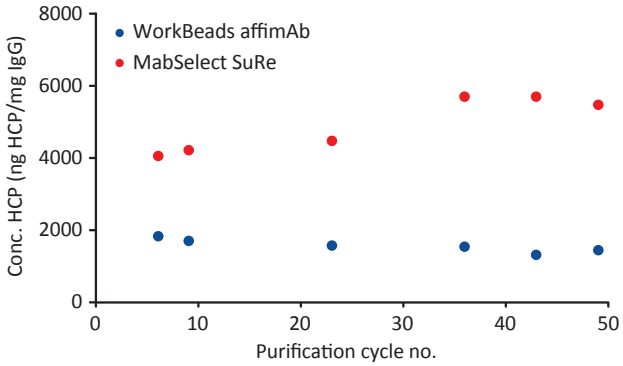
1. 5 CV PBS, pH 7.4 at 1.4 ml/min (2.4 min RT)
2. 0.5 M NaOH, 15 min contact time at 1 ml/min
3. 5 CV PBS, pH 7.4 at 1.4 ml/min
4. 5 CV 0.1 M glycine-HCl, pH 2.7 at 1.4 ml/min
5. 5 CV PBS, pH 7.4 at 1.4 ml/min

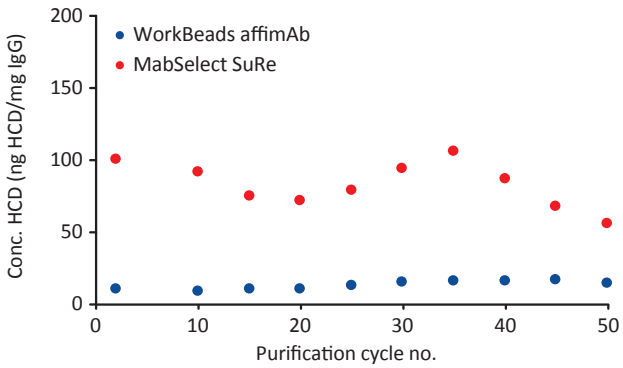
0.5 M NaOH, 15 min contact time for 120 cycles



HCP and HCD impurities in eluted mAb

Columns:	WorkBeads affimAb: 6.6 × 50 mm, 1.7 ml MabSelect SuRe: 6.6 × 50 mm, 1.7 ml
Feed:	18 ml clarified cell supernatant from CHO cells (100 cm/h)
Binding/wash buffer:	PBS, pH 7.4 (300 cm/h)
Elution buffer:	100 mM glycine-HCl, pH 2.7 (150 cm/h)
CIP:	0.5 M NaOH (100 cm/h), 10 minutes contact time in each cycle
HCP:	CHO CHP ELISA kit (#F550, Cygnus Technologies)
HCD:	Quant-iT™ PicoGreen™ dsDNA Assay Kit (#P7589, ThermoFisher)





Technical specifications

	WorkBeads affimAb	WorkBeads Protein A
Matrix	Rigid, highly cross-linked agarose	Rigid, highly cross-linked agarose
Average particle size[1] (D_{v50})	50 µm	45 µm
Ligand	Alkali stable recombinant protein A expressed in *E. coli* using animal-free medium	Recombinant protein A expressed in *E. coli* using animal-free medium
Dynamic binding capacity[2] (DBC)	> 40 mg human IgG/ml resin	> 40 mg human IgG/ml resin
Max. recommended flow rate[3]	300 cm/h	300 cm/h
Chemical stability	Compatible with all standard aqueous buffers used for protein purification, 0.5 M NaOH, (pH 12), 10 mM HCl (pH 2), 0.1 M sodium citrate-HCl (pH 3), 6 M guanidine-HCl, 20% ethanol Should not be stored at low pH for prolonged time.	Compatible with all standard aqueous buffers used for protein purification, 10 mM HCl (pH 2), 0.1 M sodium citrate-HCl (pH 3), 6 M guanidine-HCl, 20% ethanol, 10 mM NaOH (pH 12) Should not be stored at low pH for prolonged time.
pH stability	3 to 10	3 to 10
Cleaning-in-place (CIP) stability	Up to 0.5 M NaOH	10 mM NaOH
Storage	2 to 8°C in 20 % ethanol	2 to 8°C in 20 % ethanol

[1] *The median particle size of the cumulative volume distribution.*

[2] *DBC was determined at 10% breakthrough ($Q_{B10\%}$) by frontal analysis with 1 mg/ml human polyclonal IgG in PBS, pH 7.4 at 1.4 ml/min (245 cm/h, 2.5 minutes residence time) in a column packed with WorkBeads affimAb resin, column bed 6.6 × 100 mm.*

[3] *Recommended flow rate at 20°C using aqueous buffers.*

	BabyBio affimAb	BabyBio A
Resin	WorkBeads affimAb	WorkBeads Protein A
Matrix	Rigid, highly cross-linked agarose	Rigid, highly cross-linked agarose
Average particle size[1] (D_{v50})	50 µm	45 µm
Ligand	Alkali stable recombinant protein A expressed in *E. coli* using animal-free medium	Recombinant protein A expressed in *E. coli* using animal-free medium
Dynamic binding capacity[2] (DBC)	> 40 mg human IgG/ml resin	> 40 mg human IgG/ml resin
Column volume	1 ml 5 ml	1 ml 5 ml
Column dimension	7 × 28 mm (1 ml) 13 × 38 mm (5 ml)	7 × 28 mm (1 ml) 13 × 38 mm (5 ml)
Recommended flow rate[3]		
BabyBio 1 ml	0.2 to 1 ml/min (28 to 150 cm/h)	0.3 to 1 ml/min (47 to 150 cm/h)
BabyBio 5 ml	0.9 to 4 ml/min (38 to 180 cm/h)	1 to 4 ml/min (45 to 180 cm/h)
Maximum flow rate[4]		
BabyBio 1 ml	4 ml/min (620 cm/h)	4 ml/min (620 cm/h)
BabyBio 5 ml	15 ml/min (670 cm/h)	15 ml/min (670 cm/h)
Maximum back pressure	0.3 MPa, 3 bar, 43 psi	0.3 MPa, 3 bar, 43 psi
Chemical stability	Compatible with all standard aqueous buffers used for protein purification	Compatible with all standard aqueous buffers used for protein purification
pH stability	3 to 10	3 to 10
Cleaning-in-place (CIP) stability	Up to 0.5 M NaOH	10 mM NaOH
Storage	2 to 8°C in 20 % ethanol	2 to 8°C in 20 % ethanol

[1] *The median particle size of the cumulative volume distribution.*

[2] *DBC was determined at 10% breakthrough ($Q_{B10\%}$) by frontal analysis with 1 mg/ml human polyclonal IgG in PBS, pH 7.4 at 1.4 ml/min (245 cm/h, 2.5 minutes residence time) in a column packed with WorkBeads affimAb resin, column bed 6.6 × 100 mm.*

[3] *Recommended flow rates include the flow rates in all steps; cleaning, equilibration, applying sample, washing, elution etc.*

[4] *Decrease the max flow rate if the liquid has a higher viscosity. Higher viscosities can be caused by low temperature (use half of the max flow rate when operating at 4°C), or by additives (e.g., use half of the max flow rate for 20% ethanol).*

Ordering information

Product name	Pack size	Article number
WorkBeads affimAb	25 ml	40 800 001
	200 ml	40 800 002
	1 L	40 800 010
	5 L	40 800 050
	10 L	40 800 060
BabyBio affimAb 1 ml	1 ml × 1	45 800 101
	1 ml × 2	45 800 102
	1 ml × 5	45 800 103
	1 ml × 10	45 800 104
BabyBio affimAb 5 ml	5 ml × 1	45 800 105
	5 ml × 2	45 800 106
	5 ml × 5	45 800 107
	5 ml × 10	45 800 108
WorkBeads Protein A	10 ml	40 605 003
	100 ml	40 605 004
	1 L	40 605 005
BabyBio A 1 ml	1 ml × 1	45 605 101
	1 ml × 2	45 605 102
	1 ml × 5	45 605 103
	1 ml × 10	45 605 104
BabyBio A 5 ml	5 ml × 1	45 605 105
	5 ml × 2	45 605 106
	5 ml × 5	45 605 107
	5 ml × 10	45 605 108

More information

Data Sheet, DS 40 800 010
WorkBeads affimAb, BabyBio affimAb

Data Sheet, DS 40 605 010
WorkBeads Protein A, BabyBio A

www.bio-works.com/product/affinity-chromatography

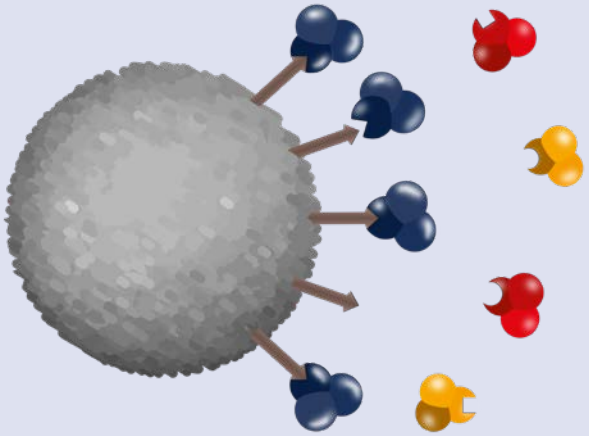
Immobilized metal ion affinity chromatography

Immobilized metal ion affinity chromatography (IMAC) separates most proteins with exposed histidine, cysteine and tryptophan on their surface. IMAC is an excellent technique for optimization and purification of His-tagged proteins. The technique is ideal for capture directly from clarified cell lysate. The target protein is collected in a highly purified and concentrated form.

Several factors influence the final purity of a His-tagged protein after an IMAC purification, for example, position of the tag (C- or N-terminal), the length of the tag, immobilized metal ion (Ni^{2+}, Co^{2+}, Zn^{2+}, Cu^{2+}) and the ligand immobilized on the matrix (NTA or IDA). To make the optimization of His-tagged protein purifications as efficient as possible Bio-Works offers products with many combinations of metal ion and immobilized ligand, as well as His-tag NTA Screening kits and His-tag IDA Screening kits.

Target molecules

His-tagged proteins and other proteins with exposed histidine, cysteine and tryptophan on their surface.



Schematic depicting Immobilized metal ion affinity chromatography

Precharged IMAC resin resistant to DTT and EDTA

WorkBeads NiMAC
BabyBio NiMAC

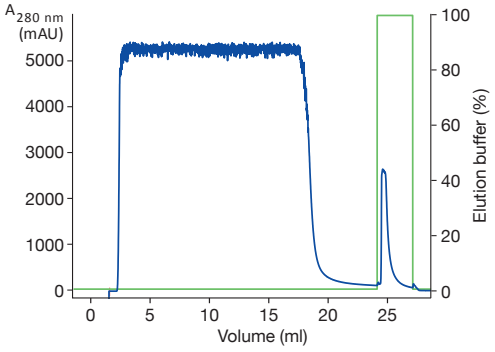
- Resin with extra strongly bound Ni^{2+} resulting in extremely low nickel ion leakage
- Highly resistant to reducing agents up to 20 mM DTT
- Highly resistant to chelating substances present in eukaryotic extracts or up to 20 mM EDTA
- High purity and reproducible results
- Prepacked in BabyBio 1 ml and 5 ml columns

Applications

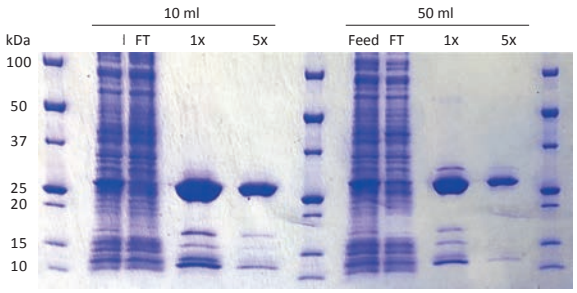
Larger sample load incl. 20 mM DTT and 20 mM Na_2-EDTA

Column:	BabyBio NiMAC 1 ml
Sample:	50 ml His_6-GFP in binding buffer with 20 mM DTT and 20 mM Na_2-EDTA
Binding buffer:	50 mM sodium phosphate, 300 mM NaCl, 10 mM imidazole, pH 8.0
Elution buffer:	50 mM sodium phosphate, 300 mM NaCl, 300 mM imidazole, pH 8.0
Elution:	Step gradient, 100% elution buffer, 10 column volumes (CV)
Flow rates:	0.5 ml/min (78 cm/h; elution); 1 ml/min (loading)

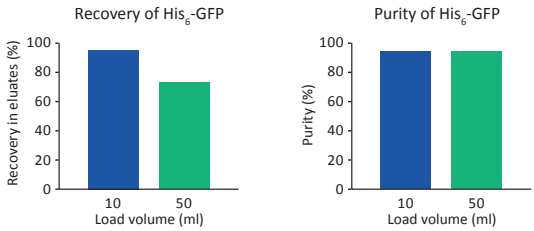
(A)



(B)



(C)



(A) Chromatogram with 50 ml load of His_6-GFP, (B) SDS-PAGE under reducing conditions of the feed, flow-through (FT) and eluted pool (1x: concentrated eluate, 5x: 1:5 diluted eluate) from 10 ml sample load and 50 ml sample load. (C) Comparison of target recovery and purity for the two different sample load purifications.

IMAC resins precharged with different metal ions

WorkBeads 40 Ni-NTA
WorkBeads 40 Co-NTA
WorkBeads 40 Zn-NTA
WorkBeads 40 Cu-NTA
WorkBeads 40 Ni-IDA
WorkBeads 40 Co-IDA
WorkBeads 40 Zn-IDA
WorkBeads 40 Cu-IDA

- Resins immobilized with either NTA (Nitrilotriacetic acid) or IDA (Iminodiacetic acid) and four different choices of metal ions Ni^{2+}, Co^{2+}, Zn^{2+} or Cu^{2+}
- Precharged with different metal ions for ease of use
- Low leakage of immobilized ligand and metal ions
- Resistant to harsh cleaning agents (NaOH). *Note!* The metal ions have to be stripped off before cleaning
- High binding capacity and flow rate

BabyBio NTA His-tag Screening kit
BabyBio IDA His-tag Screening kit

- Easy screening for optimized purity of His-tagged proteins
- 1 ml × 4 and 5 ml × 4 prepacked columns with precharged WorkBeads NTA or WorkBeads IDA resins for fast and convenient sceening
- Each kit includes one column each of WorkBeads resins precharged with Ni^{2+}, Co^{2+}, Zn^{2+} and Cu^{2+}
- Easy to use with a syringe or chromatography system

BabyBio Ni-NTA, BabyBio Co-NTA
BabyBio Zn-NTA, BabyBio Cu-NTA

BabyBio Ni-IDA, BabyBio Co-IDA
BabyBio Zn-IDA, BabyBio Cu-IDA

- Prepacked for fast and reproducible purifications
- 1 ml and 5 ml columns with precharged WorkBeads NTA or WorkBeads IDA resins
- Easy to use with a syringe or chromatography system

Applications

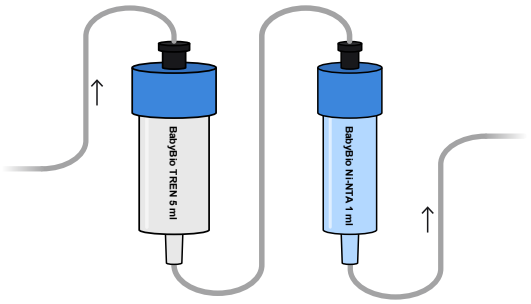
Purification of His-tagged protein on BabyBio Ni-NTA *vs.* HisTrap FF +/- upstream BabyBio TREN

Purification of complex feeds expressed in different host cells can result in an extensive bioburden on the capture column in the form of DNA and different protein impurities when the feed is directly loaded without major pre-treatments. These impurities also often bind non-specifically to the target molecules and/or resin, and thus may be co-eluted with the final product.

One example of such a complex feed is His-tagged proteins expressed in bacteria. Therefore, WorkBeads 40 TREN prepacked in a BabyBio TREN column was introduced as a pre-treatment step upstream the IMAC columns when purifying the *E. coli* translation initiation factor 3 (IF-3-His$_6$). Since this protein has a nucleic acid binding domain, host cell nucleic acids can potentially be a major co-eluting impurity in the eluates.

The BabyBio TREN column was operated in flow-through mode to capture impurities. This resin binds host cell nucleic acid (HCD), endotoxins, viruses and various host cell proteins (HCP), thereby reducing the foulant load on the subsequent IMAC column. The effect of the TREN column was evaluated by examining the removal of HCD and HCPs, see analysis below.

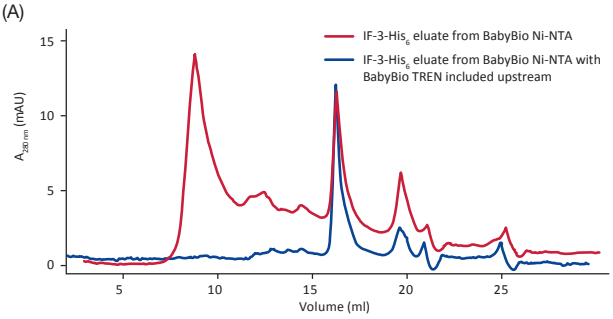
Schematic view of BabyBio TREN upsteam BabyBio Ni-NTA



Analytical SEC of eluted IF-3-His$_6$ from only BabyBio Ni-NTA compared to BabyBio Ni-NTA in combination with BabyBio TREN

Sample volumes: 200 µL
Column: Superdex™ 200 10/300 GL (Cytiva)
Buffer: 20 mM PBS, pH 7.4
Flow rate: 30 cm/h (0.3 ml/min)

(A)

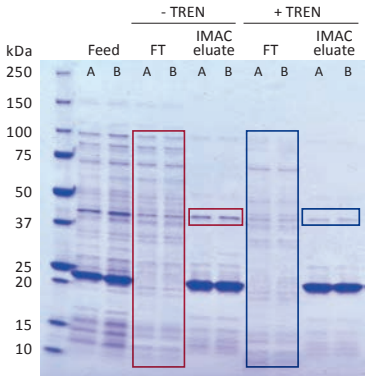


IF-3-His$_6$ purification on BabyBio Ni-NTA and HisTrap FF +/- upstream BabyBio TREN

The effects of WorkBeads 40 TREN as a pre-treatment step:

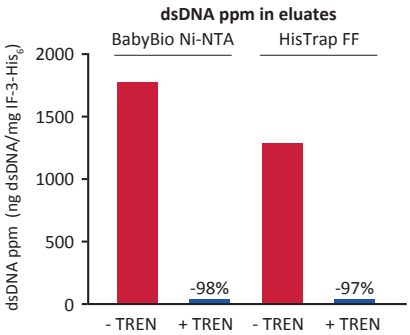
- Increased purity in flow-throughs and eluates (Figures A-D)
- > 99.9% HCD removal in feed and 96-98% HCD removal in eluates
- No significant loss of target protein recovery (Figure B)
- ELISA showed that BabyBio TREN removes 49-62% more HCPs in eluates
- BabyBio Ni-NTA and HisTrap FF show analogous results (Figures B-D)

(B)

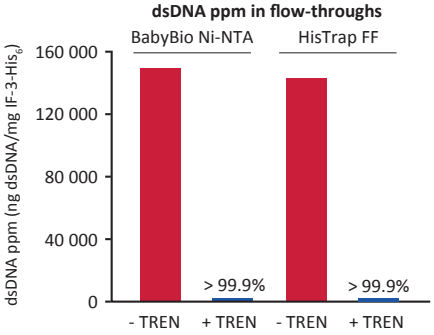


A – Samples from BabyBio Ni-NTA run
B – Samples from HisTrap FF run

(C)



(D)



Conclusion

The final purity of the eluted His-tagged proteins, regarding HCD presence, was increased 97 – 98% when BabyBio TREN was placed upstream the IMAC column compared to a stand-alone step with only IMAC. Moreover, the purity was increased in terms of less co-eluted HCPs. In conclusion, the addition of an upstream pre-treatment step is highly advantageous to include early in a purification process to remove especially host-cell DNA that tend to interfere with downstream chromatographic processes.

Uncharged IMAC resins

WorkBeads 40 NTA
WorkBeads 40 IDA

- Resins immobilized with either NTA (Nitrilotriacetic acid) or IDA (Iminodiacetic acid) for immobilization of your choice of metal ion
- Low leakage of immobilized ligand and metal ions of choice
- Resistant to harsh cleaning agents (NaOH)
  Note! The metal ions have to be stripped off before cleaning
- High binding capacity and flow rate

BabyBio NTA
BabyBio IDA

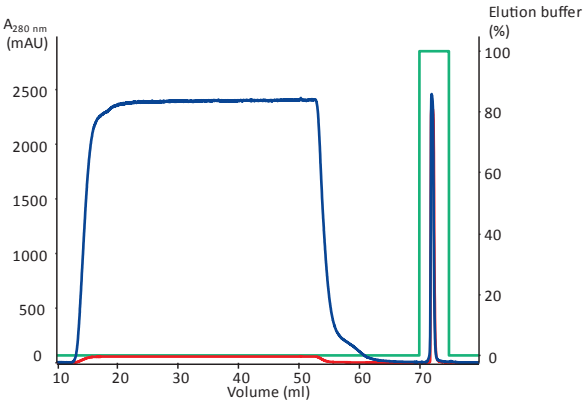
- Prepacked for fast and reproducible purifications
- 1 ml and 5 ml columns with WorkBeads NTA or WorkBeads IDA
- Fast and convenient to immobilize your choice of metal ions
- Easy to use with a syringe or chromatography system

Applications

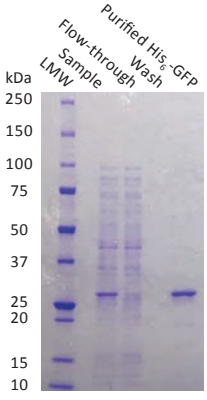
Purification of clarified His_6-GFP on BabyBio Ni-NTA

Column:	BabyBio Ni-NTA 1 ml
Sample:	40 ml His_6-GFP in binding buffer
Binding buffer:	50 mM sodium phosphate, 300 mM NaCl, 10 mM imidazole, pH 8.0
Elution buffer:	50 mM sodium phosphate, 300 mM NaCl, 300 mM imidazole, pH 8.0
Elution:	100% elution buffer in 5 CV
Elution flow rate:	0.5 ml/min (75 cm/h)

(A)



(B)



(A) Chromatogram of the capture and elution of His_6-GFP. Absorbance at 280 nm (blue), absorbance at 490 nm (red) and percentage of elution buffer (green).
(B) SDS-PAGE analysis of sample, flow-through, wash and eluted peak.

Technical specifications

	WorkBeads NiMAC
Target substance	His-tagged proteins
Matrix	Highly cross-linked agarose
Average particle size[1] (D_{V50})	45 µm
Precharged ions	Nickel (II) ions, Ni^{2+}
Static binding capacity	> 80 mg/ml resin
Dynamic binding capacity[2]	> 40 mg/ml resin
Metal ion capacity[3]	> 60 µmol Cu^{2+}/ml resin
Max flow rate (20 cm bed height and 5 bar)	600 cm/h
Chemical stability	Compatible with all standard aqueous buffers used for protein purification, and additives such as 20 mM Na_2-EDTA, 20 mM dithiothreitol (DTT), 20 mM TECP, 20 mM β-mercaptoethanol, 8 M urea, 6 M guanidine-HCl, non-ionic detergents, 500 mM imidazole, 30% isopropanol, 0.5 M NaOH
pH stability	3 to 9 (working range) 2 to 14 (cleaning-in-place)
Storage	2 to 25°C in 20% ethanol

[1] *The median particle size of the cumulative volume distribution.*
[2] *Binding capacity may vary depending on protein characteristics and on flow rate used. A lower flow rate usually increases the dynamic binding capacity.*
[3] *Metal ion capacity is determined by frontal analysis at 50% breakthrough using copper solution.*

	BabyBio NiMAC
Target substance	His-tagged proteins
Matrix	WorkBeads NiMAC
Column volume	1 ml 5 ml
Column dimension	7 × 28 mm (1 ml) 13 × 38 mm (5 ml)
Recommended flow rate[1]	
BabyBio NiMAC 1 ml BabyBio NiMAC 5 ml	0.25 to 1 ml/min (37 to 150 cm/h) 1.25 to 5 ml/min (56 to 225 cm/h)
Max flow rate[2]	
BabyBio NiMAC 1 ml BabyBio NiMAC 5 ml	5 ml/min (780 cm/h) 20 ml/min (900 cm/h)
Maximum back pressure	0.3 MPa, 3 bar, 43 psi
Chemical stability	Compatible with all standard aqueous buffers used for protein purification, and additives such as 20 mM Na2-EDTA, 20 mM dithiothreitol (DTT), 20 mM TECP, 20 mM β-mercaptoethanol, 8 M urea, 6 M guanidine-HCl, non-ionic detergents, 500 mM imidazole, 30% isopropanol, 0.5 M NaOH
pH stability	3 to 9 (working range) 2 to 14 (cleaning-in-place)
Storage	2 to 25°C in 20% ethanol

[1] *Optimal flow rate during binding is depending on the sample. During column wash and elution, a flow rate of 1 ml/min and 5 ml/min can be used for 1 ml and 5 ml columns, respectively. Note: The maximum pressure the packed bed can withstand depends on the sample/liquid viscosity and chromatography resin characteristics. The pressure also depends on the tubing used to connect the column and the system restrictions after the column outlet.*
[2] *Maximum flow rate for aqueous buffers at 20°C. Decrease the maximum flow rate if the liquid has a higher viscosity.*

Higher viscosities can be caused by low temperature or presence of additives. Use half of the maximum flow rate for 20% ethanol for example.

Technical specifications

	WorkBeads 40 Ni-NTA WorkBeads 40 Ni-IDA	WorkBeads 40 Co-NTA WorkBeads 40 Co-IDA	WorkBeads 40 Cu-NTA WorkBeads 40 Cu-IDA	WorkBeads 40 Zn-NTA WorkBeads 40 Zn-IDA
Matrix	Highly cross-linked agarose	Highly cross-linked agarose	Highly cross-linked agarose	Highly cross-linked agarose
Average particle size[1] (D_{V50})	45 µm	45 µm	45 µm	45 µm
Chelating ligand	Nitrilotriacetic acid (NTA) or Iminodiacetic acid (IDA)	NTA or IDA	NTA or IDA	NTA or IDA
Metal ion	Nickel (II)	Cobalt (II)	Copper (II)	Zink (II)
Metal ion capacity for the chelating ligand[2]	N/A	N/A	50 to 60 µmol Cu^{2+}/ml (WorkBeads 40 Cu-IDA)	N/A
Dynamic binding capacity[3] (DBC)	> 60 mg His_6-GFP/ml resin	N/A	N/A	N/A
Maximum flow rate (20 cm bed height, 5 bar)	600 cm/h	600 cm/h	600 cm/h	600 cm/h
Chemical stability	Compatible with all standard aqueous buffers used for protein purification, 8 M urea, 6 M guanidine-HCl, non-ionic detergents, 20% ethanol. Chelating substances (e.g. EDTA) will strip off the metal ions. Stripped resin: 10 mM HCl (pH 2), 10 mM NaOH (pH 12), 10 mM sodium citrate-HCl (pH 3).			
pH stability	7 to 9 (working) 2 to 12 (cleaning, stripped resin)	7 to 9 (working) 2 to 12 (cleaning, stripped resin)	7 to 9 (working) 2 to 12 (cleaning, stripped resin)	7 to 9 (working) 2 to 12 (cleaning, stripped resin)
Storage	2 to 25°C in 20% ethanol	2 to 25°C in 20% ethanol	2 to 25°C in 20% ethanol	2 to 25°C in 20% ethanol

[1] *The median particle size of the cumulative volume distribution.*
[2] *Metal ion capacity is determined by frontal analysis at 50% breakthrough using cupper solution.*
[3] *The binding capacity is determined using a BabyBio Ni-NTA 1 ml, equal value is expected for IDA resins. The binding capacity is dependent on the size of the target protein, and on the competition of impurities.*

	BabyBio: Ni-NTA, Co-NTA, Cu-NTA, Zn-NTA	BabyBio: Ni-IDA, Co-IDA, Cu-IDA, Zn-IDA
Resin	WorkBeads 40 Ni-NTA, WorkBeads 40 Co-NTA WorkBeads 40 Cu-NTA, WorkBeads 40 Zn-NTA	WorkBeads 40 Ni-IDA, WorkBeads 40 Co-IDA WorkBeads 40 Cu-IDA, WorkBeads 40 Zn-IDA
Matrix	Rigid, highly cross-linked agarose	Rigid, highly cross-linked agarose
Average particle size[1] (D_{V50})	45 µm	45 µm
Ligand	Nitrilotriacetic acid (NTA)	Iminodiacetic acid (IDA)
Metal ion	Ni^{2+}, Co^{2+}, Cu^{2+} or Zn^{2+}	Ni^{2+}, Co^{2+}, Cu^{2+} or Zn^{2+}
Static binding capacity[2]	70 mg His-tagged protein/ml resin	N/A
Dynamic binding capacity[2] (DBC)	50 mg His-tagged protein/ml resin	N/A
Column volume	1 and 5 ml	1 and 5 ml
Column dimension	7 × 28 mm (1 ml) 13 × 38 mm (5 ml)	7 × 28 mm (1 ml) 13 × 38 mm (5 ml)
Recommended flow rates[3] BabyBio 1 ml BabyBio 5 ml	 0.25 to 1 ml/min (37 to 150 cm/h) 1.25 to 5 ml/min (56 to 225 cm/h)	 0.25 to 1 ml/min (37 to 150 cm/h) 1.25 to 5 ml/min (56 to 225 cm/h)
Maximum flow rate[4] BabyBio 1 ml BabyBio 5 ml	 5 ml/min (780 cm/h) 20 ml/min (900 cm/h)	 5 ml/min (780 cm/h) 20 ml/min (900 cm/h)
Maximum back pressure	0.3 MPa, 3 bar, 43 psi	0.3 MPa, 3 bar, 43 psi
Chemical stability	Compatible with all standard aqueous buffers used for protein purifications, 8 M urea, 6 M guanidine-HCl, non-ionic detergents, 20% ethanol. Chelating substances (e.g. EDTA) will strip off the metal ions. Stripped resin: 10 mM HCl (pH 2), 10 mM NaOH (pH 12), 100 mM sodium citrate-HCl (pH 3).	
pH stability	7 to 9 (working) 2 to 12 (cleaning, stripped resin)	7 to 9 (working) 2 to 12 (cleaning, stripped resin)
Storage	2 to 25°C in 20% ethanol	2 to 25°C in 20% ethanol

[1] *The median particle size of the cumulative volume distribution.*
[2] *The binding capacity is determined using a BabyBio Ni-NTA 1 ml. The binding capacity is dependent on the size of the target protein, and on the competition with impurities.*
[3] *Optimal flow rate during binding is depending on the sample. During column wash and elution, a flow rate of 1 ml/min and 5 ml/min can be used for 1 ml and 5 ml columns, respectively. Note: The maximum pressure the packed bed can withstand depends on the sample/liquid viscosity and chromatography resin characteristics. The pressure also depends on the tubing used to connect the column and the system restrictions after the column outlet.*
[4] *Aqueous buffers at 20°C. Decrease the maximum flow rate if the liquid has a higher viscosity. Higher viscosities can be caused by low temperature (use half of the maximum flow rate at 4°C), or by additives (e.g., use half of the maximum flow rate for 20% ethanol).*

Technical specifications

	WorkBeads 40 NTA	WorkBeads 40 IDA
Matrix	Highly cross-linked agarose	Highly cross-linked agarose
Average particle size[1] (D_{V50})	45 µm	45 µm
Chelating ligand	Nitrilotriacetic acid (NTA)	Iminodiacetic acid (IDA)
Metal ion capacity[2]	20 to 30 µmol Cu^{2+}/ml resin	50 to 60 µmol Cu^{2+}/ml resin
Maximum flow rate	600 cm/h (20 cm bed height, 5 bar)	600 cm/h (20 cm bed height, 5 bar)
Chemical stability	Compatible with all standard aqueous buffers used for protein purification, 8 M urea, 6 M guanidine-HCl, non-ionic detergents, 20% ethanol. Chelating substances (e.g. EDTA) will strip off the metal ions. Stripped resin: 10 mM HCl (pH 2), 10 mM NaOH (pH 12), 10 mM sodium citrate-HCl (pH 3).	
pH stability	7 to 9 (working range) 2 to 12 (cleaning, stripped resin)	7 to 9 (working range) 2 to 12 (cleaning, stripped resin)
Storage	2 to 25°C in ethanol	2 to 25°C in ethanol

[1] *The median particle size of the cumulative volume distribution.*

[2] *Metal ion capacity is determined by frontal analysis at 50% breakthrough using cupper solution.*

	BabyBio NTA	BabyBio IDA
Resin	WorkBeads 40 NTA	WorkBeads 40 IDA
Matrix	Rigid, highly cross-linked agarose	Rigid, highly cross-linked agarose
Average particle size[1] (D_{V50})	45 µm	45 µm
Ligand	NTA	IDA
Column volume	1 ml 5 ml	1 ml 5 ml
Column dimension	7 × 28 mm (1 ml) 13 × 38 mm (5 ml)	7 × 28 mm (1 ml) 13 × 38 mm (5 ml)
Recommended flow rates[2]		
BabyBio 1 ml BabyBio 5 ml	0.25 to 1 ml/min (37 to 150 cm/h) 1.25 to 5 ml/min (56 to 225 cm/h)	0.25 to 1 ml/min (37 to 150 cm/h) 1.25 to 5 ml/min (56 to 225 cm/h)
Maximum flow rate[3]		
BabyBio 1 ml BabyBio 5 ml	5 ml/min (780 cm/h) 20 ml/min (900 cm/h)	5 ml/min (780 cm/h) 20 ml/min (900 cm/h)
Maximum back pressure	0.3 MPa, 3 bar, 43 psi	0.3 MPa, 3 bar, 43 psi
Chemical stability	Compatible with all standard aqueous buffers used for protein purifications, 8 M urea, 6 M guanidine-HCl, non-ionic detergents, 20% ethanol. Chelating substances (e.g. EDTA) will strip off the metal ions. Stripped resin: 10 mM HCl (pH 2), 10 mM NaOH (pH 12), 100 mM sodium citrate-HCl (pH 3).	
pH stability	7 to 9 (working range) 2 to 12 (cleaning, stripped resin)	7 to 9 (working range) 2 to 12 (cleaning, stripped resin)
Storage	2 to 25°C in 20% ethanol	2 to 25°C in 20% ethanol

[1] *The median particle size of the cumulative volume distribution.*

[2] *Optimal flow rate during binding is depending on the sample. During column wash and elution, a flow rate of 1 ml/min and 5 ml/min can be used for 1 ml and 5 ml columns, respectively. Note: The maximum pressure the packed bed can withstand depends on the sample/liquid viscosity and chromatography resin characteristics. The pressure also depends on the tubing used to connect the column and the system restrictions after the column outlet.*

[3] *Aqueous buffers at 20°C. Decrease the maximum flow rate if the liquid has a higher viscosity. Higher viscosities can be caused by low temperature (use half of the maximum flow rate at 4°C), or by additives (e.g. use half of the maximum flow rate for 20% ethanol).*

Ordering information

Product name	Pack size	Article number
WorkBeads NiMAC	25 ml 150 ml 1 L	40 653 001 40 653 003 40 653 010
WorkBeads 40 Ni-NTA	25 ml 150 ml 1 L	40 651 001 40 651 003 40 651 010
WorkBeads 40 Co-NTA	25 ml 150 ml 1 L	40 651 401 40 651 403 40 651 410
WorkBeads 40 Cu-NTA	25 ml 150 ml 1 L	40 651 301 40 651 303 40 651 310
WorkBeads 40 Zn-NTA	25 ml 150 ml 1 L	40 651 501 40 651 503 40 651 510
WorkBeads 40 Ni-IDA	25 ml 150 ml 1 L	40 650 001 40 650 003 40 650 010
WorkBeads 40 Co-IDA	25 ml 150 ml 1 L	40 650 401 40 650 403 40 650 410
WorkBeads 40 Cu-IDA	25 ml 150 ml 1 L	40 650 301 40 650 303 40 650 310
WorkBeads 40 Zn-IDA	25 ml 150 ml 1 L	40 650 501 40 650 503 40 650 510
BabyBio NiMAC 1 ml	1 ml × 1 1 ml × 2 1 ml × 5 1 ml × 10	45 655 311 45 655 312 45 655 313 45 655 314
BabyBio NiMAC 5 ml	5 ml × 1 5 ml × 2 5 ml × 5 5 ml × 10	45 655 315 45 655 316 45 655 317 45 655 318
BabyBio NTA His-tag Screening kit 1 ml[1]	1 ml × 4	45 700 101
BabyBio NTA His-tag Screening kit 5 ml[1]	5 ml × 4	45 700 102
BabyBio IDA His-tag Screening kit 1 ml[1]	1 ml × 4	45 700 001
BabyBio IDA His-tag Screening kit 5 ml[1]	5 ml × 4	45 700 002
BabyBio Ni-NTA 1 ml	1 ml × 1 1 ml × 2 1 ml × 5 1 ml × 10 1 ml × 100	45 655 101 45 655 102 45 655 103 45 655 104 45 655 110
BabyBio Ni-NTA 5 ml	5 ml × 1 5 ml × 2 5 ml × 5 5 ml × 10 5 ml × 100	45 655 105 45 655 106 45 655 107 45 655 108 45 655 109
BabyBio Co-NTA 1 ml	1 ml × 1 1 ml × 2 1 ml × 5 1 ml × 10	45 655 131 45 655 132 45 655 133 45 655 134
BabyBio Co-NTA 5 ml	5 ml × 1 5 ml × 2 5 ml × 5 5 ml × 10	45 655 135 45 655 136 45 655 137 45 655 138
BabyBio Cu-NTA 1 ml	1 ml × 1 1 ml × 2 1 ml × 5 1 ml × 10	45 655 121 45 655 122 45 655 123 45 655 124
BabyBio Cu-NTA 5 ml	5 ml × 1 5 ml × 2 5 ml × 5 5 ml × 10	45 655 125 45 655 126 45 655 127 45 655 128

[1] *Includes one column each charged with Ni^{2+}, Co^{2+}, Cu^{2+} or Zn^{2+}*

Ordering information

Product name	Pack size	Article number
BabyBio Zn-NTA 1 ml	1 ml × 1 1 ml × 2 1 ml × 5 1 ml × 10	45 655 141 45 655 142 45 655 143 45 655 144
BabyBio Zn-NTA 5 ml	5 ml × 1 5 ml × 2 5 ml × 5 5 ml × 10	45 655 145 45 655 146 45 655 147 45 655 148
BabyBio Ni-IDA 1 ml	1 ml × 1 1 ml × 2 1 ml × 5 1 ml × 10	45 655 001 45 655 002 45 655 003 45 655 004
BabyBio Ni-IDA 5 ml	5 ml × 1 5 ml × 2 5 ml × 5 5 ml × 10	45 655 005 45 655 006 45 655 007 45 655 008
BabyBio Co-IDA 1 ml	1 ml × 1 1 ml × 2 1 ml × 5 1 ml × 10	45 655 031 45 655 032 45 655 033 45 655 034
BabyBio Co-IDA 5 ml	5 ml × 1 5 ml × 2 5 ml × 5 5 ml × 10	45 655 035 45 655 036 45 655 037 45 655 038
BabyBio Cu-IDA 1 ml	1 ml × 1 1 ml × 2 1 ml × 5 1 ml × 10	45 655 021 45 655 022 45 655 023 45 655 024
BabyBio Cu-IDA 5 ml	5 ml × 1 5 ml × 2 5 ml × 5 5 ml × 10	45 655 025 45 655 026 45 655 027 45 655 028
BabyBio Zn-IDA 1 ml	1 ml × 1 1 ml × 2 1 ml × 5 1 ml × 10	45 655 041 45 655 042 45 655 043 45 655 044
BabyBio Zn-IDA 5 ml	5 ml × 1 5 ml × 2 5 ml × 5 5 ml × 10	45 655 045 45 655 046 45 655 047 45 655 048

More information

Data Sheet, DS 40 653 010
WorkBeads NiMAC, BabyBio NiMAC

Data Sheet, DS 40 650 010
WorkBeads 40 Ni-NTA, WorkBeads 40 Co-NTA,
WorkBeads 40 Zn-NTA, WorkBeads 40 Cu-NTA

WorkBeads 40 Ni-IDA, WorkBeads 40 Co-IDA,
WorkBeads 40 Zn-IDA, WorkBeads 40 Cu-IDA

BabyBio Ni-NTA, BabyBio Co-NTA,
BabyBio Zn-NTA, BabyBio Cu-NTA
BabyBio Ni-IDA, BabyBio Co-IDA,
BabyBio Zn-IDA, BabyBio Cu-IDA

BabyBio NTA His-tag Screening kit
BabyBio IDA His-tag Screening kit

www.bio-works.com/product/imac-resin

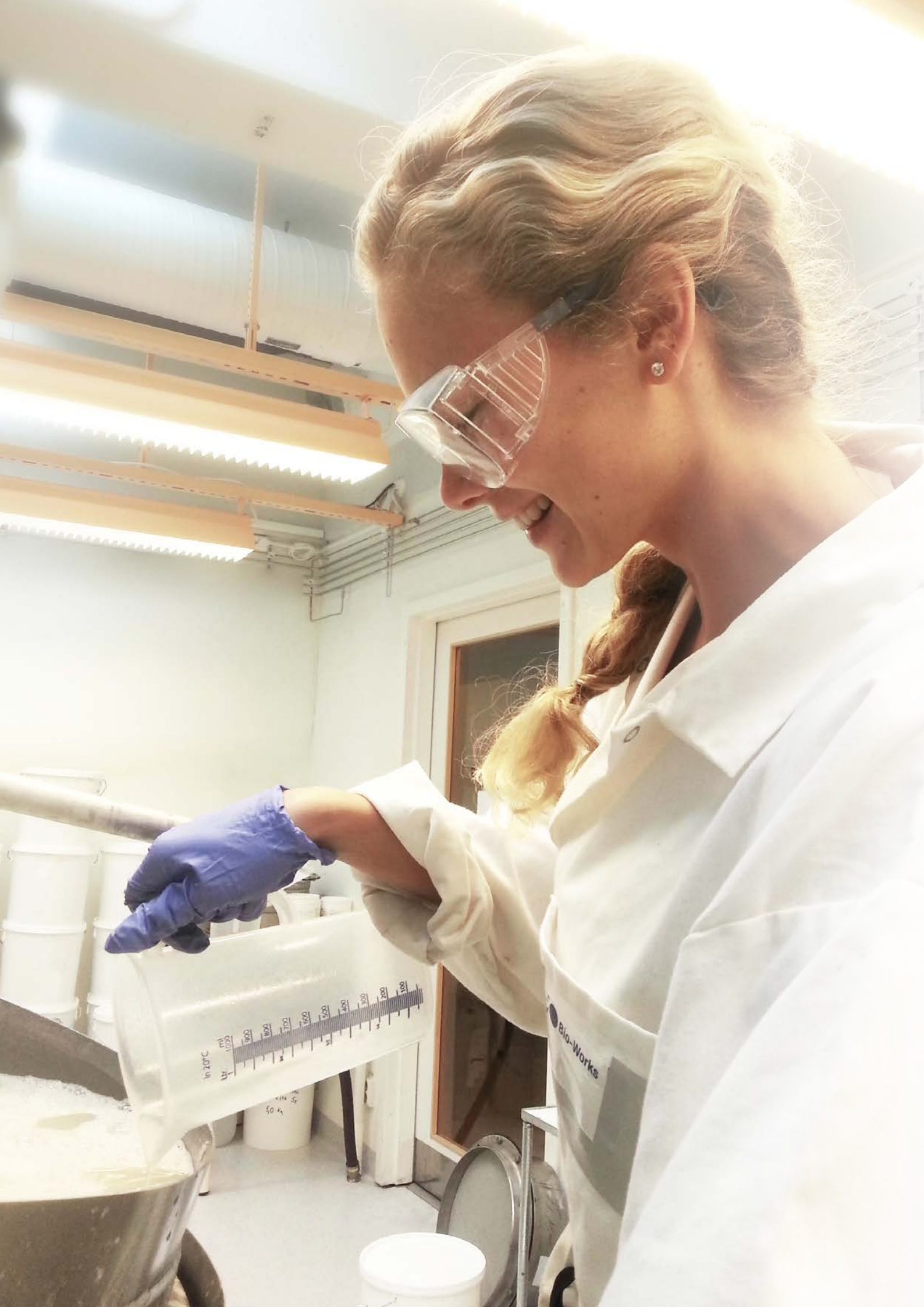
Ordering information

Product name	Pack size	Article number
WorkBeads 40 NTA	25 ml 150 ml 1 L	40 602 001 40 602 003 40 602 010
WorkBeads 40 IDA	25 ml 150 ml 1 L	40 601 001 40 601 003 40 601 010
BabyBio NTA 1 ml	1 ml × 1 1 ml × 2 1 ml × 5 1 ml × 10	45 655 111 45 655 112 45 655 113 45 655 114
BabyBio NTA 5 ml	5 ml × 1 5 ml × 2 5 ml × 5 5 ml × 10	45 655 115 45 655 116 45 655 117 45 655 118
BabyBio IDA 1 ml	1 ml × 1 1 ml × 2 1 ml × 5 1 ml × 10	45 655 011 45 655 012 45 655 013 45 655 014
BabyBio IDA 5 ml	5 ml × 1 5 ml × 2 5 ml × 5 5 ml × 10	45 655 015 45 655 016 45 655 017 45 655 018

More information

Data Sheet, DS 40 600 010
WorkBeads 40 NTA, WorkBeads 40 IDA
BabyBio NTA, BabyBio IDA

www.bio-works.com/product/imac-resin


Bio-Works

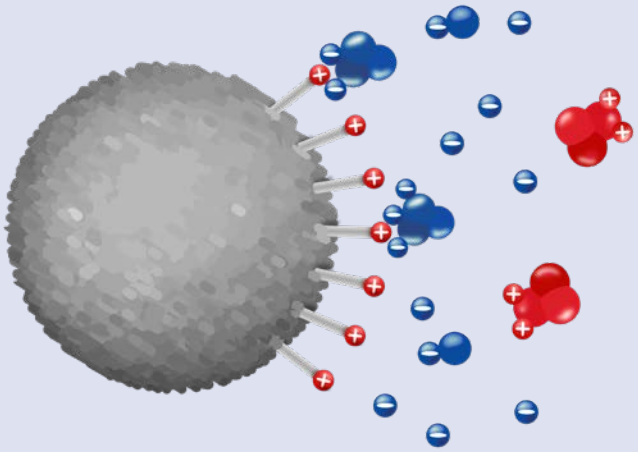
Ion exchange chromatography

Ion exchange chromatography (IEX) is a very useful technique that separates proteins on the basis of differences in their net surface charge in relation to pH of the surroundings. Every protein has its own charge/pH relationship.

WorkBeads ion exchangers are ideal for proteins, peptides and oligonucleotides. They show excellent results for larger peptides, particularly insulin. Two different bead sizes are available for optimal purity in all different steps during a purification process, the capture, the enhancement and the polishing steps.

Target molecules

In general most proteins, peptides and oligonucleotides. IEX is a universal purification technique suitable in all purification steps in a process.

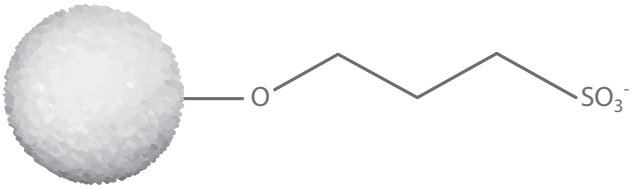


Schematic depicting ion exchange chromatography

Cation exchangers

WorkBeads 40S
WorkBeads 100S

- Designed for research and industrial scale purifications of proteins and peptides
- Two different bead sizes, 45 µm and 100 µm
- High chemical stability for easy cleaning-in-place
- High binding capacity during high flow rates



Structure of the ligand used in WorkBeads 40S

OptioBio 40S 10x100

- Prepacked glass column for reliable and reproducible results
- Optimal for high-performance small-scale purification
- 10 cm bed height for fast method optimization in bioprocess development

BabyBio S

- Prepacked for fast and reproducible purifications
- BabyBio 1 ml and 5 ml columns
- Easy to use with a syringe or chromatography system

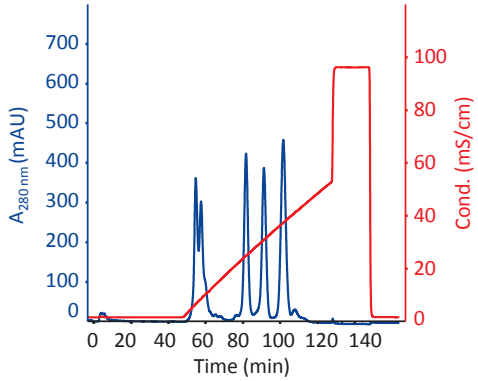
Applications

Comparison of prepacked cation exchangers

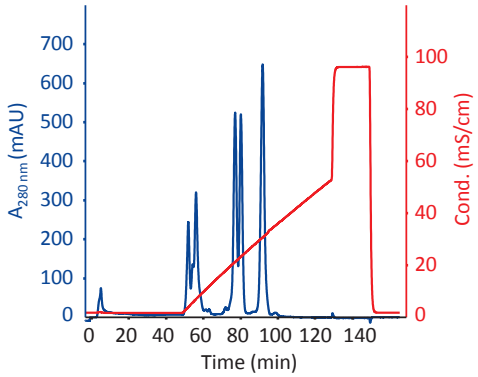
Prepacked column:	OptioBio 40S 10x100
Resin:	WorkBeads 40S
Sample:	2.5 ml 1.5 mg/ml Concanavalin A, 1.5 mg/ml Ribonuclease A, 0.5 mg/min α-chymotrypsinogen A, 0.5 mg/ml Lysozyme
Binding buffer:	50 mM MES, pH 6.0
Elution buffer:	0-50% in 20 CV 50 mM MES, 1 M NaCl, pH 6.0
Flow rate:	2 ml/min, 150 cm/h, 4 min RT

Prepacked column:	HiScreen™ Capto™ SP ImpRes (Cytiva)
Resin:	Capto SP ImpRes
Sample:	1.5 ml 1.5 mg/ml Concanavalin A, 1.5 mg/ml Ribonuclease A, 0.5 mg/min α-chymotrypsinogen A, 0.5 mg/ml Lysozyme
Binding buffer:	50 mM MES, pH 6.0
Elution buffer:	0-50% in 20 CV 50 mM MES, 1 M NaCl, pH 6.0
Flow rate:	1.2 ml/min, 150 cm/h, 4 min RT

OptioBio 40S 10x100



HiScreen Capto SP ImpRes



Peptide purification, comparison of dynamic binding capacity and purity

Sample:	45 amino acid residue peptide
Resins:	WorkBeads 40S Capto SP ImpRes
Column:	10 × 240 mm, 19 ml
Flow:	2 ml/min (150 cm/h)
Buffers:	15% acetonitrile in a proprietary buffer composition

Resin	DBC (mg/ml) at 2.0 min residence time	DBC (mg/ml) at 1.1 min residence time	Purity (%)[1]
WorkBeads 40S	150	140	91.8
Capto SP ImpRes	125	123	85.2

[1] *Load of 30 g/L crude feed containing 55% target peptide.*

Technical specifications

	WorkBeads 40S	WorkBeads 100S
Matrix	Rigid, highly cross-linked agarose	Rigid, highly cross-linked agarose
Average particle size[1] (D_{v50})	45 µm	90 to 110 µm
Ionic group (ligand)	Sulfonate ($-SO_3^-$)	Sulfonate ($-SO_3^-$)
Ionic capacity	180 to 250 µmol H^+/ml resin	180 to 250 µmol H^+/ml resin
Dynamic binding capacity[2] (DBC)	130 mg BSA/ml resin	> 100 mg BSA/ml resin
Pressure flow characteristic	N/A	2 bar at 900 cm/h, 25 mm diameter × 20 cm bed height
Maximum flow rate	600 cm/h (20 cm bed height, 5 bar)	N/A
Chemical stability	Compatible with all standard aqueous buffers used for protein purification, 1 M NaOH, 30% isopropanol or 70% ethanol. Should not be stored at < pH 3 for prolonged time.	
pH stability	2 to 13	2 to 13
Storage	2 to 25°C in 20% ethanol with 0.2 M sodium acetate	2 to 25°C in 20% ethanol with 0.2 M sodium acetate

[1] *The median particle size of the cumulative volume distribution.*
[2] *Dynamic binding capacity determined at 4-minutes residence time in 20 mM Na-citrate, pH 4.0.*

	OptioBio 40S 10x100
Resin	WorkBeads 40S
Matrix	Rigid, highly cross-linked agarose
Average particle size (D_{V50})[1]	45 µm
Ionic group (ligand)	Sulfonate ($-SO_3^-$)
Ionic capacity	180 to 250 µmol H^+/ml resin
Dynamic binding capacity[2] (DBC)	150 mg BSA/ml resin
Column volume	7.9 ml
Column dimension	10 × 100 mm
Recommended flow rate	2 to 4 ml/min (150 to 300 cm/h)
Maximum flow rate[3]	6 ml/min (450 cm/h)
Column hardware pressure limit	2.1 MPa, 21 bar, 305 psi
Chemical stability	Compatible with all standard buffers used for protein purification, 1 M NaOH, 30 % isopropanol or 70 % ethanol. Should not be stored at < pH 3 for prolonged time.
pH stability	2 to 13
Storage	2 to 25°C in 20% ethanol with 0.2 M sodium acetate

[1] *The median particle size of the cumulative volume distribution.*
[2] *Dynamic binding capacity determined in 20 mM Na-citrate, pH 4.0, at a flow of 2 ml/min (150 cm/h; 4 minutes residence time).*
[3] *Maximum flow rate for aqueous buffers at 20°C. Decrease the maximum flow rate if the liquid has a higher viscosity. Higher viscosities can be caused by low temperature. Use half of the maximum flow rate for 20% ethanol.*

	BabyBio S
Resin	WorkBeads 40S
Matrix	Rigid, highly cross-linked agarose
Average particle size[1] (D_{V50})	45 µm
Ionic group (ligand)	Sulfonate ($-SO_3^-$)
Ion capacity	180 to 250 µmol H^+/ml resin
Dynamic binding capacity[2] (DBC)	130 mg BSA/ml resin
Column volume	1 ml and 5 ml
Column dimension	7 × 28 mm (1 ml) 13 × 38 mm (5 ml)
Recommended flow rate[3] BabyBio 1 ml BabyBio 5 ml	 0.25 to 1 ml/min (37 to 150 cm/h) 1.25 to 5 ml/min (56 to 225 cm/h)

	BabyBio S
Maximum flow rate[4] BabyBio 1 ml BabyBio 5 ml	 5 ml/min (780 cm/h) 20 ml/min (900 cm/h)
Maximum back pressure	0.3 MPa, 3 bar, 43 psi
Chemical stability	Compatible with all standard aqueous buffers used for protein purification and 70% ethanol. Should not be stored at low pH for prolonged time.
pH stability	2 to 13
Storage	2 to 25°C in 20% ethanol with 0.2 M sodium acetate

1 *The median particle size of the cumulative volume distribution.*
2 *Dynamic binding capacity determined at 4 minutes residence time (0.25 ml/min in 1 ml column) in 20 mM Na-citrate, 60 mM NaCl, pH 4.0.*
3 *Optimal flow rate during binding is depending on the sample. During column wash and elution, a flow rate of 1 ml/min and 5 ml/min can be used for 1 ml and 5 ml columns, respectively. Note: The maximum pressure the packed bed can withstand depends on the sample/liquid viscosity and chromatography resin characteristics. The pressure also depends on the tubing used to connect the column and the system restrictions after the column outlet.*
4 *Maximum flow rate for aqueous buffers at 20°C. Decrease the maximum flow rate if the liquid has a higher viscosity. Higher viscosities can be caused by low temperature (use half of the maximum flow rate for 20% ethanol).*

Ordering information

Product name	Pack size	Article number
WorkBeads 40S	25 ml	40 200 001
	200 ml	40 200 002
	1 L	40 200 010
	5 L	40 200 050
	10 L	40 200 060
WorkBeads 100S	25 ml	10 200 001
	200 ml	10 200 002
	500 ml	10 200 005
	1 L	10 200 010
	5 L	10 200 050
	10 L	10 200 060
OptioBio 40S 10×100	7.9 ml × 1	55 420 011

Product name	Pack size	Article number
BabyBio IEX Screening Kit[1]	1 ml × 4	45 900 001
BabyBio Peptide Purification Kit[2]	1 ml × 2	45 300 102
BabyBio S 1 ml	1 ml × 1	45 200 101
	1 ml × 2	45 200 102
	1 ml × 5	45 200 103
	1 ml × 10	45 200 104
BabyBio S 5 ml	5 ml × 1	45 200 105
	5 ml × 2	45 200 106
	5 ml × 5	45 200 107
	5 ml × 10	45 200 108

1 *Includes one 1 ml column of each: BabyBio S, BabyBio Q, BabyBio DEAE, BabyBio TREN.*
2 *Bundle of: BabyBio S 1 ml × 1 and BabyBio Q 1 ml × 1.*

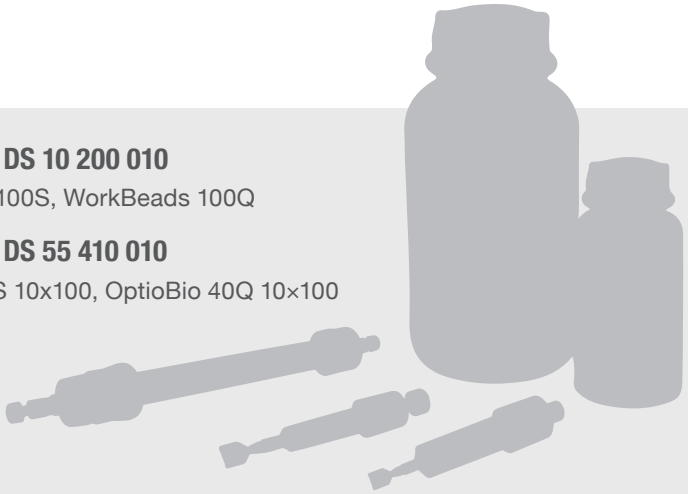
More information

Data Sheet, DS 40 100 010
WorkBeads 40S, WorkBeads 40Q, WorkBeads 40 DEAE
BabyBio S, BabyBio Q, BabyBio DEAE, BabyBio TREN, BabyBio IEX Screening Kit, BabyBio Peptide Purification Kit

Data Sheet, DS 10 200 010
WorkBeads 100S, WorkBeads 100Q

Data Sheet, DS 55 410 010
OptioBio 40S 10x100, OptioBio 40Q 10×100

www.bio-works.com/product/iex-resin
www.bio-works.com/product/optiobio-columns



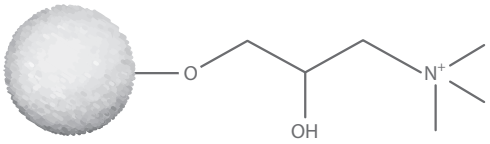
Anion exchangers

Target molecules

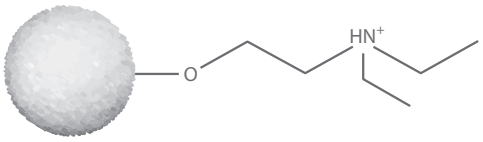
In general most proteins and peptides. IEX is a universal purification technique suitable in all purification steps in a process. Anion exchangers are also excellent for purification of oligonucleotides.

WorkBeads 40Q
WorkBeads 100Q
WorkBeads 40 DEAE

- Available with two different ligands, strong anion exchanger (Q) and weak anion exchanger (DEAE)
- Designed for research and industrial scale purifications of proteins, peptides and oligonucleotides
- Two different bead sizes, 45 µm and 100 µm
- High chemical stability for easy cleaning-in-place
- High binding capacity during high flow rates



Structure of the ligand used in WorkBeads 40Q



Structure of the ligand used in WorkBeads 40 DEAE

OptioBio 40Q 10x100

- Prepacked glass column for reliable and reproducible results
- Optimal for high-performance small-scale purification
- 10 cm bed height for fast method optimization in bioprocess development

BabyBio Q
BabyBio DEAE

- Prepacked for fast and reproducible purifications
- 1 ml and 5 ml columns packed with WorkBeads 40Q and WorkBeads 40 DEAE
- Easy to use with a syringe or chromatography system

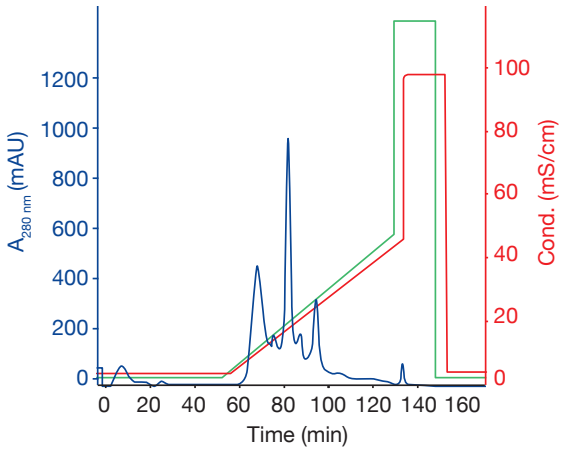
Applications

Comparison of prepacked anion exchangers

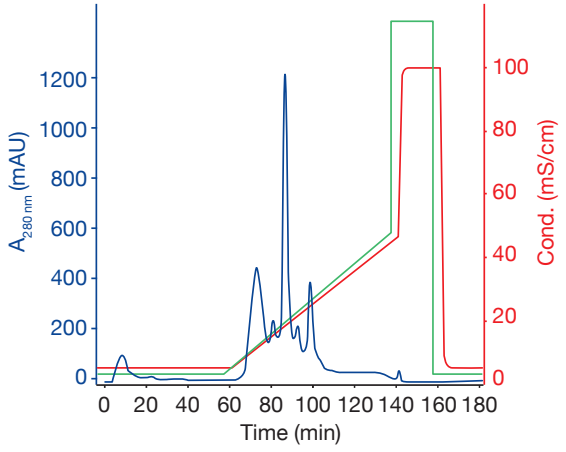
Prepacked column:	OptioBio 40Q 10x100
Resin:	WorkBeads 40Q
Sample:	10 ml 0.7 mg/ml apo-transferrin, 0.45 mg/ml α-lactalbumin, 1.4 mg/ml soybean trypsin inhibitor
Binding buffer:	50 mM Tris-HCl, pH 7.4
Elution buffer:	0-40% over 20 CV, 50 mM Tris-HCl, 1 M NaCl pH 7.4
Flow rate:	2 ml/min, 150 cm/h, 4 min RT

Prepacked column:	HiScreen Capto Q ImpRes (Cytiva)
Resin:	Capto Q ImpRes
Sample:	6 ml 0.7 mg/ml apo-transferrin, 0.45 mg/ml α-lactalbumin, 1.4 mg/ml soybean trypsin inhibitor
Binding buffer:	50 mM Tris-HCl, pH 7.4
Elution buffer:	0-40% over 20 CV, 50 mM Tris-HCl, 1 M NaCl pH 7.4
Flow rate:	1.2 ml/min, 150 cm/h, 4 min RT

OptioBio 40Q 10x100



HiScreen Capto Q ImpRes



Technical specifications

	WorkBeads 40Q	WorkBeads 100Q
Matrix	Rigid, highly cross-linked agarose	Rigid, highly cross-linked agarose
Average particle size[1] (D_{v50})	45 µm	90 to 110 µm
Ionic group (ligand)	Quarternary amine ($-N^+(CH_3)_3$)	Quarternary amine ($-N^+(CH_3)_3$)
Ionic capacity	180 to 250 µmol Cl^-/ml resin	140 to 200 µmol Cl^-/ml resin
Dynamic binding capacity[2] (DBC)	47 mg BSA/ml resin	> 40 mg BSA/ml resin
Pressure flow characteristic	N/A	2 bar at 900 cm/h, 25 mm diameter × 20 cm bed height
Maximum flow rate	5 bar at 600 cm/h, 20 cm bed height	N/A
Chemical stability	Compatible with all standard aqueous buffers used for protein purification, 1 M NaOH, 30% isopropanol or 70% ethanol. Should not be stored at < pH 3 for prolonged time	
pH stability	2 to 13	2 to 13
Storage	2 to 25°C in 20% ethanol	2 to 25°C in 20% ethanol

[1] *The median particle size of the cumulative volume distribution.*
[2] *Dynamic binding capacity determined at 2.5 minutes residence time in 50 mM Tris-HCl, 50 mM NaCl, pH 8.0.*

	BabyBio Q	OptioBio 40Q 10x100
Resin	WorkBeads 40Q	WorkBeads 40Q
Matrix	Rigid, highly cross-linked agarose	Rigid, highly cross-linked agarose
Average particle size[1] (D_{V50})	45 µm	45 µm
Ionic group (ligand)	Quarternary amine ($-N^+(CH_3)_3$)	Quarternary amine ($-N^+(CH_3)_3$)
Ion capacity	180 to 250 µmol Cl^-/ml resin	180 to 250 µmol Cl^-/ml resin
Dynamic binding capacity[2] (DBC)	50 mg BSA/ml resin	47 mg BSA/ml resin
Column volume	1 ml 5 ml	7.9 ml
Column dimension	7 × 28 ml (1 ml) 13 × 38 ml (5 ml)	10 × 100 mm
Recommended flow rate[3]	BabyBio 1 ml, 0.25 to 1 ml/min (37 to 150 cm/h) BabyBio 5 ml, 1.25 to 5 ml/min (56 to 225 cm/h)	2 to 4 ml/min (150 to 300 cm/h)
Maximum flow rate[4]	BabyBio 1 ml, 5 ml/min (780 cm/h) BabyBio 5 ml, 20 ml/min (900 cm/h)	6 ml/min (450 cm/h)
Column hardware pressure limit	0.3 MPa, 3 bar, 43 psi	2.1 MPa, 21 bar, 305 psi
Chemical stability	Compatible with all standard aqueous buffers used for protein purification, 1 M NaOH, 30% isopropanol or 70% ethanol. Should not be stored at < pH 3 for prolonged time.	
pH stability	2 to 13	2 to 13
Storage	2 to 25°C in 20% ethanol	2 to 25°C in 20% ethanol

1 *The median particle size of the cumulative volume distribution.*
2 *Dynamic binding capacity determined at 4-minutes residence time in 50 mM Tris-HCl, 50 mM NaCl, pH 8.0.*
3 *Optimal flow rate during binding is depending on the sample. During column wash and elution, a flow rate of 1 ml/min and 5 ml/min can be used for 1 ml and 5 ml columns, respectively. Note: The maximum pressure the packed bed can withstand depends on the sample/liquid viscosity and chromatography resin characteristics. The pressure also depends on the tubing used to connect the column and the system restrictions after the column outlet.*
4 *Maximum flow rate for aqueous buffers at 20°C. Decrease the maximum flow rate if the liquid has a higher viscosity. Higher viscosities can be caused by low temperature. Use half of the maximum flow rate for 20% ethanol.*

	WorkBeads 40 DEAE	BabyBio DEAE
Resin	NA	WorkBeads 40 DEAE
Matrix	Rigid, highly cross-linked agarose	Rigid, highly cross-linked agarose
Average particle size[1] (D_{V50})	45 µm	45 µm
Ionic group (ligand)	Diethylaminoethyl ($-CH_2CH_2N^+H(CH_2CH_3)_2$)	Diethylaminoethyl ($-CH_2CH_2N^+H(CH_2CH_3)_2$)
Ion capacity	110 to 160 µmol Cl^-/ml resin	110 to 160 µmol Cl^-/ml resin
Dynamic binding capacity[2] (DBC)	40 mg BSA/ml resin	40 mg BSA/ml resin
Column volume	N/A	1 ml 5 ml
Column dimension	N/A	7 × 28 mm (1 ml) 13 × 38 mm (5 ml)
Recommended flow rate[3]	150 to 300 cm/h	BabyBio 1 ml, 0.25 to 1 ml/min (37 to 150 cm/h) BabyBio 5 ml, 1.25 to 5 ml/min (56 to 225 cm/h)
Maximum flow rate[4]	600 cm/h (20 cm bed height, 5 bar)	BabyBio 1 ml, 5 ml/min (780 cm/h) BabyBio 5 ml, 20 ml/min (900 cm/h)
Maximum back pressure	N/A	0.3 MPa, 3 bar, 43 psi
Chemical stability	Compatible with all standard aqueous buffers used for protein purification, 1 M NaOH, 30% isopropanol or 70% ethanol. Should not be stored at < pH 3 for prolonged time	
pH stability	3 to 13 3 to 9 (recommended pH)	3 to 13 3 to 9 (recommended pH)
Storage	2 to 25°C in 20% ethanol	2 to 25°C in 20% ethanol

1 *The median particle size of the cumulative volume distribution.*
2 *Dynamic binding capacity determined at 4 minutes residence time (0.25 ml/min in 1 ml column) in 50 mM Tris-HCl, pH 8.0.*
3 *Optimal flow rate during binding is depending on the sample. During column wash and elution, a flow rate of 1 ml/min and 5 ml/min can be used for 1 ml and 5 ml columns, respectively. Note: The maximum pressure the packed bed can withstand depends on the sample/liquid viscosity and chromatography resin characteristics. The pressure also depends on the tubing used to connect the column and the system restrictions after the column outlet.*
4 *Maximum flow rate for aqueous buffers at 20°C. Decrease the maximum flow rate if the liquid has a higher viscosity. Higher viscosities can be caused by low temperature (use half of the maximum flow rate for 20% ethanol).*

Ordering information

Product name	Pack size	Article number
WorkBeads 40Q	25 ml 200 ml 1 L 5 L 10 L	40 100 001 40 100 002 40 100 010 40 100 050 40 100 060
WorkBeads 100Q	25 ml 200 ml 500 ml 1 L 5 L 10 L	10 100 001 10 100 002 10 100 005 10 100 010 10 100 050 10 100 060
WorkBeads 40 DEAE	25 ml 200 ml 1 L 5 L 10 L	40 150 001 40 150 002 40 150 010 40 150 050 40 150 060
OptioBio 40Q 10x100	7.9 ml × 1	55 410 011
BabyBio IEX Screening Kit[1] BabyBio Peptide Purification Kit[2]	1 ml × 4 1 ml × 2	45 900 001 45 300 102
BabyBio Q 1 ml	1 ml × 1 1 ml × 2 1 ml × 5 1 ml × 10	45 100 101 45 100 102 45 100 103 45 100 104
BabyBio Q 5 ml	5 ml × 1 5 ml × 2 5 ml × 5 5 ml × 10	45 100 105 45 100 106 45 100 107 45 100 108
BabyBio DEAE 1 ml	1 ml × 1 1 ml × 2 1 ml × 5 1 ml × 10	45 150 101 45 150 102 45 150 103 45 150 104
BabyBio DEAE 5 ml	5 ml × 1 5 ml × 2 5 ml × 5 5 ml × 10	45 150 105 45 150 106 45 150 107 45 150 108

[1] *Includes one 1 ml column of each: BabyBio S, BabyBio Q, BabyBio DEAE, BabyBio TREN.*
[2] *Bundle of: BabyBio S 1 ml × 1 and BabyBio Q 1 ml × 1.*

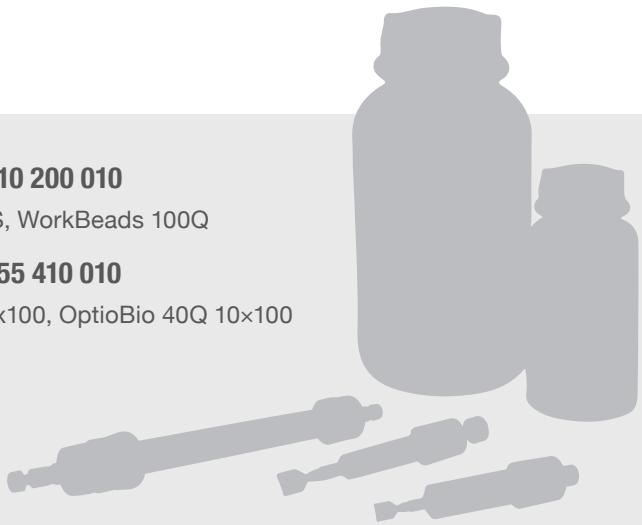
More information

Data Sheet, DS 40 100 010
WorkBeads 40S, WorkBeads 40Q, WorkBeads 40 DEAE
BabyBio S, BabyBio Q, BabyBio DEAE, BabyBio TREN, BabyBio IEX Screening Kit, BabyBio Peptide Purification Kit

Data Sheet, DS 10 200 010
WorkBeads 100S, WorkBeads 100Q

Data Sheet, DS 55 410 010
OptioBio 40S 10x100, OptioBio 40Q 10×100

www.bio-works.com/product/iex-resin
www.bio-works.com/product/optiobio-columns



Multimodal ion exchange chromatography

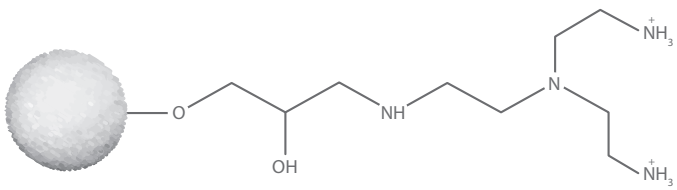
Multimodal ion exchange chromatography is also referred to as mixed-mode ion exchange chromatography. It utilizes the ionic interaction in combination with hydrophobic and other types of interactions. The combined effect gives the resin unique selectivities that adds new possibilities in biomolecule separation.

Target molecules

WorkBeads 40 TREN resin has a ligand that is positively charged below approx. pH 9. This resin can be used for several different applications, especially due to its higher salt tolerant properties, e.g., for alternative IEX selectivity, for sample cleanup in monoclonal antibody (mAb) purification processes to guard the protein A column from chromatins, viruses, endotoxins and other host cell impurities, or as a polishing step in the mAb purification process.

WorkBeads 40 TREN

- Differential selectivity due to higher salt tolerance and multimodal properties
- Reduced fouling of e.g. protein A resins by chromatin, viruses, endotoxins and host cell impurity removal
- High binding capacity and purity



Structure of the ligand used in WorkBeads 40 TREN

BabyBio TREN

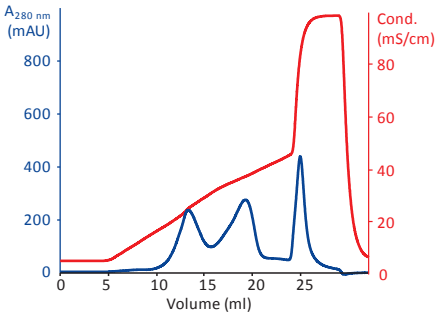
- Prepacked for fast and reproducible purifications
- 1 ml and 5 ml columns with WorkBeads 40 TREN
- Easy to use with a syringe or chromatography system

Applications

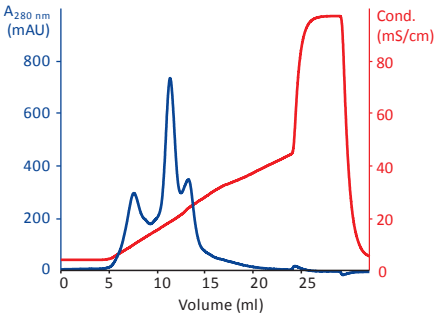
Comparison of prepacked BabyBio TREN and BabyBio DEAE

Columns:	BabyBio TREN 1 ml BabyBio DEAE 1 ml
Binding buffer:	50 mM Tris-HCl, pH 7.4
Elution buffer:	50 mM Tris-HCl, 1 M NaCl, pH 7.4
Sample:	2.5 ml of 0.3 mg/ml apo-transferrin, 0.2 mg/ml α-lactalbumin, 0.6 mg/ml soybean trypsin inhibitor in binding buffer
Flow rate:	1 ml/min (150 cm/h)
Gradient:	0 to 40% elution buffer in 20 CV

BabyBio TREN



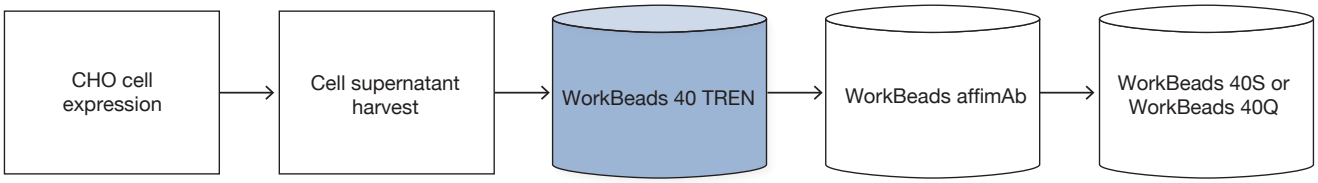
BabyBio DEAE



The peaks from left to right corresponds to apo-transferrin, α-lactalbumin and soybean trypsin inhibitor. The blue line corresponds to the absorbance at 280 nm and the red line to the conductivity.

Example of usage of WorkBeads 40 TREN in mAb purification processes

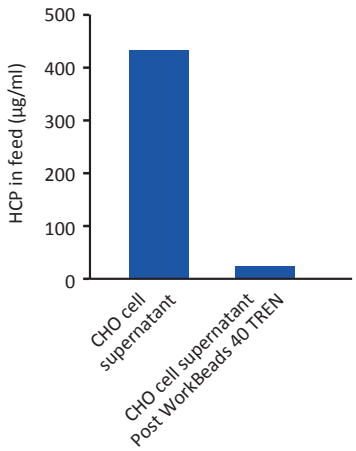
Flow-through mode, protection of Protein A resin (guard column).



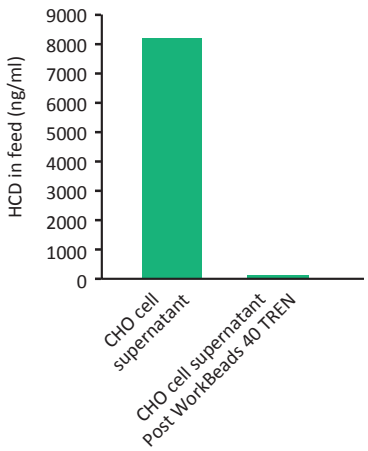
Using WorkBeads 40 TREN as a guard column before protein A

Using WorkBeads 40 TREN upstream protein A resins is an excellent tool for eliminating the extensive bioburden on the protein A resin caused by the impurities from the host cells, and thus extending the lifetime of the protein A resin. The advantage of using WorkBeads 40 TREN upstream of WorkBeads affimAb is shown below. In this experiment up to 95% of HCP and 99% of HCD have been removed from the mAb feed loaded onto the protein A resin.

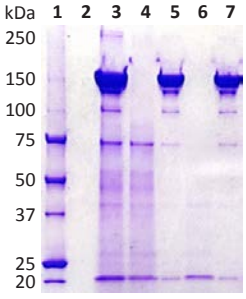
(A)



(B)



(C)



1 Marker
2 Empty
3 Starting feed
4 Flow-through (A)
5 Eluted mAb (A)
6 Flow-through (A + T)
7 Eluted mAb (A + T)

Levels of impurities in CHO cell supernatant before and after WorkBeads 40 TREN treatment. (A) HCP and (B) HCD in mAb sample loaded onto the protein A resin. (C) SDS-PAGE analyses of the feed, flow-through and eluted mAb, with or without WorkBeads 40 TREN (T) upstream WorkBeads affimAb (A).

Technical specifications

	WorkBeads 40 TREN
Matrix	Rigid, highly cross-linked agarose
Average particle size[1] (D_{v50})	45 µm
Ligand	Tris(2-aminoethyl)amine (TAEA)
Dynamic binding capacity[2]	50 mg BSA/ml resin
Maximum flow rate	600 cm/h (20 cm bed height, 5 bar)
Chemical stability	Compatible with all standard aqueous buffers used for protein purification. Should not be stored at low pH for prolonged time.
pH stability	2 to 13
Storage	2 to 25°C in 20% ethanol

[1] *The median particle size of the cumulative volume distribution.*
[2] *Dynamic binding capacity determined at 4 minutes residence time (0.25 ml/min in 1 ml column) in 50 mM Tris-HCl, 50 mM NaCl, pH 8.0. Optimal flow rate during binding is depending on the sample.*

	BabyBio TREN
Resin	WorkBeads 40 TREN
Matrix	Rigid, highly cross-linked agarose
Average particle size[1] (D_{v50})	45 µm
Ligand	Tris(2-aminoethyl)amine (TAEA)
Dynamic binding capacity[2]	50 mg BSA/ml resin
Column volume	1 ml 5 ml
Column dimension	7 × 28 mm (1 ml) 13 × 38 mm (5 ml)
Recommended flow rate[3] BabyBio 1 ml BabyBio 5 ml	 0.25 to 1 ml/min (37 to 150 cm/h) 1.25 to 5 ml/min (56 to 225 cm/h)
Maximum flow rate[4] BabyBio 1 ml BabyBio 5 ml	 5 ml/min (780 cm/h) 20 ml/min (900 cm/h)
Maximum back pressure	0.3 MPa, 3 bar, 43 psi
Chemical stability	Compatible with all standard aqueous buffers used for protein purification. Do not keep the column at low pH for prolonged time.
pH stability	2 to 13
Storage	2 to 25°C in 20% ethanol

[1] *The median particle size of the cumulative volume distribution.*
[2] *Dynamic binding capacity determined at 4 minutes residence time (0.25 ml/min in 1 ml column) in 50 mM Tris-HCl, 50 mM NaCl, pH 8.0.*
[3] *Optimal flow rate during binding is depending on the sample. During column wash and elution, a flow rate of 1 ml/min and 5 ml/min can be used for 1 ml and 5 ml columns, respectively. Note: The maximum pressure the packed bed can withstand depends on the sample/liquid viscosity and chromatography resin characteristics. The pressure also depends on the tubing used to connect the column and the system restrictions after the column outlet.*
[4] *Aqueous buffers at 20°C. Decrease the maximum flow rate if the liquid has a higher viscosity. Higher viscosities can be caused by low temperature (use half of the maximum flow rate at 4°C), or by additives (e.g., use half of the maximum flow rate for 20% ethanol).*

Ordering information

Product name	Pack size	Article number
WorkBeads 40 TREN	25 ml 150 ml 1 L	40 603 001 40 603 003 40 603 010
BabyBio TREN 1 ml	1 ml × 1 1 ml × 2 1 ml × 5 1 ml × 10	45 655 211 45 655 212 45 655 213 45 655 214
BabyBio TREN 5 ml	5 ml × 1 5 ml × 2 5 ml × 5 5 ml × 10	45 655 215 45 655 216 45 655 217 45 655 218
BabyBio IEX Screening Kit[1]	1 ml × 4	45 900 001

[1] *Inclues one 1 ml column of each: BabyBio S, BabyBio Q, BabyBio DEAE, BabyBio TREN.*

More information

Data Sheet, DS 40 600 020
WorkBeads 40 TREN, BabyBio TREN

Data Sheet, DS 40 100 010
WorkBeads 40S, WorkBeads 40Q, WorkBeads 40 DEAE
BabyBio S, BabyBio Q, BabyBio DEAE, BabyBio TREN,
BabyBio IEX Screening Kit, BabyBio Peptide Purification Kit

www.bio-works.com/product/iex-resin

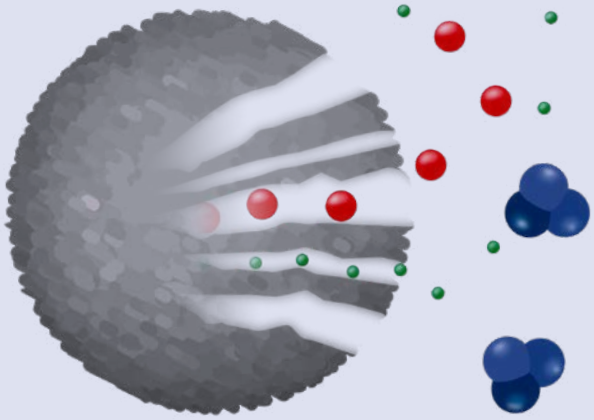
Size exclusion chromatography

Size exclusion chromatography (SEC) (also called gel filtration, GF) separates molecules on the basis of differences in size. As this is a non-binding technique the choice of running buffers is large and can be optimized for the target molecule. For best resolution when using SEC a quite slow flow rate and a sample volume of maximum 4% of the column volume should be used. This technique is therefore best suited for the polishing step in a purification process.

Target molecules

Polishing

Proteins, peptides, tagged proteins and nucleic acids. Three different pore sizes are available of WorkBeads SEC resins which make them suitable for a large range of target molecules of different sizes.



Schematic depicting size exclusion chromatography

WorkBeads 40/100 SEC
WorkBeads 40/1000 SEC
WorkBeads 40/10 000 SEC
WorkBeads Macro SEC
WorkBeads 200 SEC

- Produced using a proprietary cross-linking method that results in highly porous and physically stable matrices
- Availability in several different porosities give robust and wide separation ranges
- Alternative bead sizes for viscous samples
- Resistant to harsh cleaning agents (NaOH)

Comparison of WorkBeads SEC resins

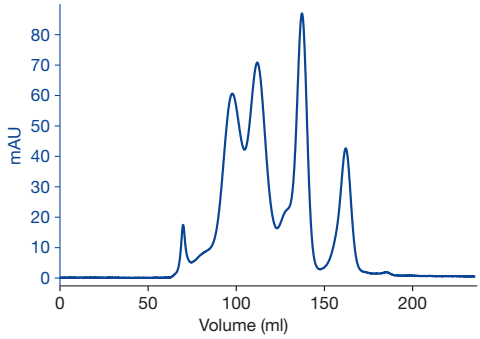
	Average bead size, µm	Separation range, kD	Exclusion limit, kD	Separation range, D 10^4 10^5 10^6 10^7 10^8
WorkBeads 40/100 SEC	45	10 – 150	150	
WorkBeads 40/1000 SEC	45	10 – 1200	1200	
WorkBeads 40/10 000 SEC	45	10 – 10 000	10 000	
WorkBeads Macro SEC	45	10 – 30 000	30 000	
WorkBeads 200 SEC	180	10 – 6000	6000	

Applications

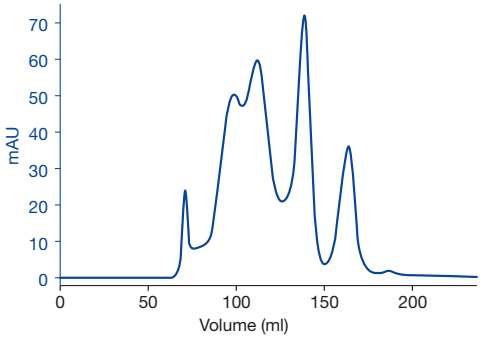
WorkBeads 40/1000 SEC, different flow rates

Resin:	WorkBeads 40/1000 SEC
Column:	16 × 950 mm, 181 ml
Sample:	250 µl, 0.5 mg/ml thyroglobulin, 0.5 mg/ml ferritin, 0.5 mg/ml ovalbumin and 0.5 mg/ml ribonuclease A (in order of elution)
Buffer:	PBS, pH 7.2
Flow rates:	25 cm/h (0.84 ml/min) 50 cm/h (1.68 ml/min) 100 cm/h (3.35 ml/min)

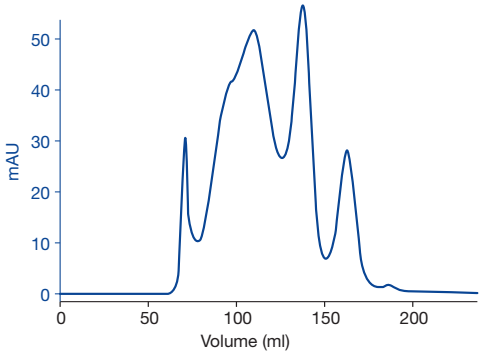
25 cm/h



50 cm/h



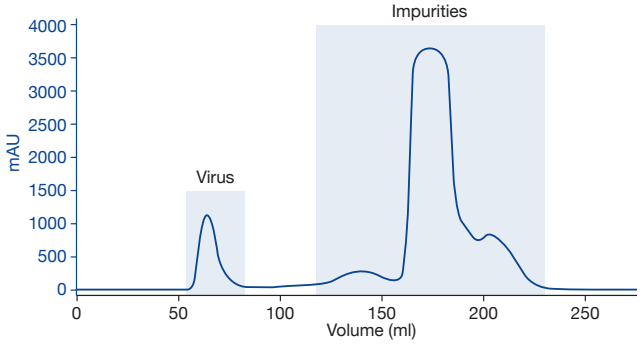
100 cm/h



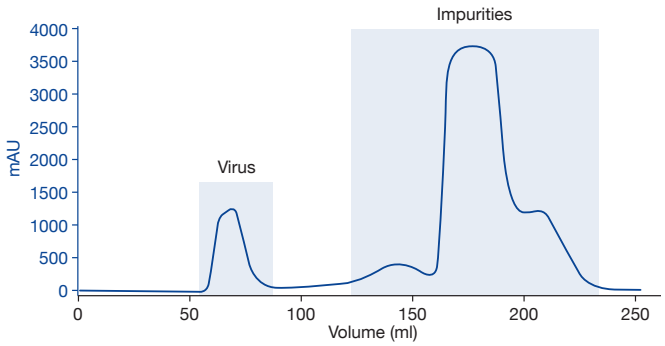
Purification of animal viral vaccine

Resin:	WorkBeads 40/1000 SEC
Sample:	Inactivated rabies virus (A) 10 ml (5.7% of CV) (B) 15 ml (8.5% of CV)
Column:	16 × 880 mm, 176 ml
Flow rate:	5 ml/min, 150 cm/h
Buffer:	PBS, pH 7.2

(A) Sample volume 5.7% of CV



(B) Sample volume 8.5 % of CV



Technical specifications

	WorkBeads 40/100 SEC	WorkBeads 40/1000 SEC	WorkBeads 40/10 000 SEC
Matrix	Rigid, highly cross-linked agarose	Rigid, highly cross-linked agarose	Rigid, highly cross-linked agarose
Separation range[1]	10 to 150 kD	10 to 1200 kD	10 to 10 000 kD
Exclusion limit	150 kD	1200 kD	10 000 kD
Average particle size[2] (D_{V50})	45 µm	45 µm	45 µm
Recommended flow rate[3]	15 to 150 cm/h	15 to 150 cm/h	15 to 150 cm/h
Maximum flow rate[4,5]	600 cm/h	600 cm/h	300 cm/h
Chemical stability	Compatible with all standard aqueous buffers used for protein purification. Should not be stored at low pH for prolonged time.		
pH stability	2 to 13	2 to 13	2 to 13
Storage	2 to 25°C in 20% ethanol	2 to 25°C in 20% ethanol	2 to 25°C in 20% ethanol

1 *Globular proteins.*
2 *The median particle size of the cumulative volume distribution.*
3 *The flow rate is important for the resolution and a lower flow rate often gives an increased resolution. A higher flow rate can be used during equilibration to speed up the separation.*
4 *Determined in water using a 25 × 200 mm column.*
5 *Note: Make sure that the column hardware max pressure is not exceeded.*

	WorkBeads Macro SEC	WorkBeads 200 SEC
Separation range[1]	10 to 30 000 kD	10 to 6000 kD
Exclusion limit	30 000 kD	6000 kD
Matrix	Highly cross-linked agarose	Highly cross-linked agarose
Average particle size[2] (D_{V50})	180 µm	180 µm
Recommended flow rate[3]	15 to 150 cm/h	15 to 150 cm/h
Max flow rate[4,5]	300 cm/h	900 cm/h
Chemical stability	Compatible with all standard aqueous buffers used for protein purification. Should not be stored at low pH for prolonged time.	
pH stability	2 to 13	2 to 13
Storage	2 to 25°C in 20% ethanol	2 to 25°C in 20% ethanol

1 *Globular proteins.*
2 *The median particle size of the cumulative volume distribution.*
3 *The flow rate is important for the resolution and a lower flow rate often gives an increased resolution. A higher flow rate can be used during equilibration to speed up the separation.*
4 *Determined in water using a 25 × 200 mm column.*
5 *Note: Make sure that the column hardware max pressure is not exceeded.*

Ordering information

Product name	Pack size	Article number
WorkBeads 40/100 SEC	25 ml	40 340 001
	300 ml	40 340 003
	1 L	40 340 010
	5 L	40 340 050
WorkBeads 40/1000 SEC	25 ml	40 300 001
	300 ml	40 300 003
	1 L	40 300 010
	5 L	40 300 050
WorkBeads 40/10 000 SEC	25 ml	40 350 001
	300 ml	40 350 003
	1 L	40 350 010
	5 L	40 350 050
WorkBeads Macro SEC	25 ml	40 370 001
	300 ml	40 370 003
	1 L	40 370 010
	5 L	40 370 050
WorkBeads 200 SEC	300 ml	20 300 003
	1 L	20 300 010
	5 L	20 300 050

More information

Data Sheet, DS 40 300 010

WorkBeads 40/100 SEC, WorkBeads 40/1000 SEC, WorkBeads 40/10 000 SEC, WorkBeads Macro SEC, WorkBeads 200 SEC

www.bio-works.com/product/sec-resin

Desalting/buffer exchange

Size exclusion chromatography run on low-porosity resins allows for group-separation of salt, buffer and other low molecular weight substances from larger biomolecules and proteins. This technique gives faster, simpler and a more effective desalting or buffer exchange compared to the traditional time consuming dialysis that may harm sensitive proteins and cause loss of proteins. Desalting is done with sample volumes up to 30% of the column volume and in minutes for lab scale volumes.

Target molecules

Proteins, large peptides (M_r > 5000), tagged proteins, nucleic acids and other biomolecules of similar size.

WorkBeads Dsalt

- Pre-swollen for fast and convenient handling
- Designed for rapid and efficient desalting and/or buffer exchange
- Group separation of high molecular weight substances from low molecular weight substances

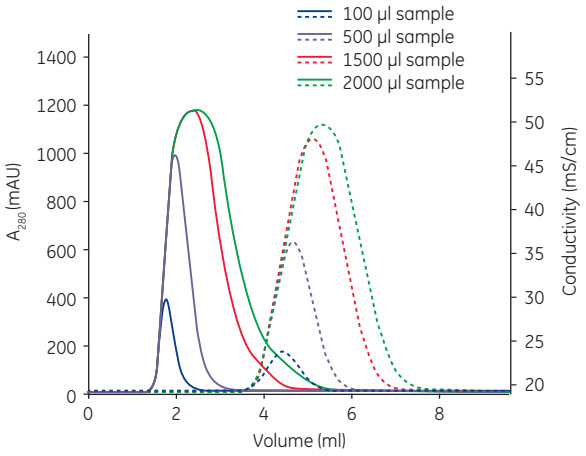
BabyBio Dsalt

- Desalting/buffer exchange in minutes
- Keep the activity of your sensitive proteins
- Sample volumes from 20 µl to 7.5 ml
- 1 ml and 5 ml prepacked columns
- Convenient scale-up by connecting columns in series
- Easy to use with a syringe or chromatography system

Applications

Desalting of 100 µl to 2000 µl sample

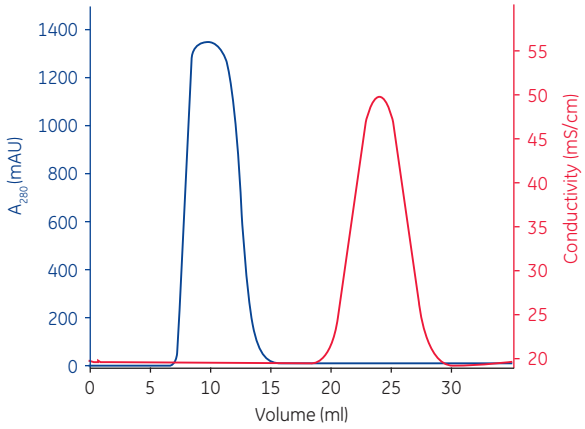
Column: BabyBio Dsalt 5 ml
Buffer: 25 mM Na-phosphate, 150 mM NaCl, pH 7.0
Sample: 2 mg/ml BSA in 20 mM Na-phosphate, 0.5 M NaCl, pH 7.0
Flow rate: 5 ml/min



The solid lines correspond to absorbance at 280 nm and the dashed lines to the conductivity.

BabyBio 5 ml × 5

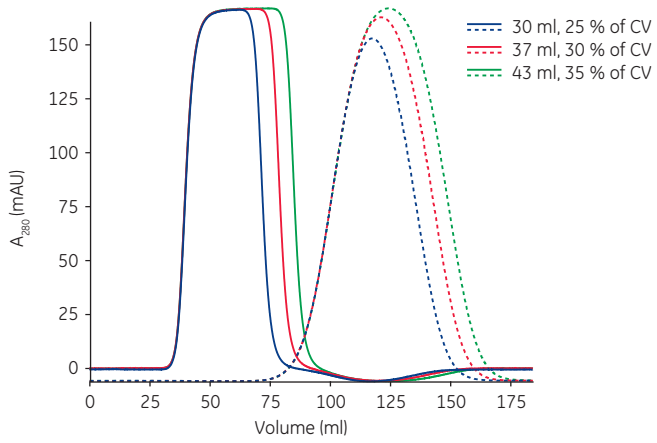
Column: BabyBio Dsalt 5 ml (5 columns connected in series)
Total column volume: 25 ml
Buffer: 25 mM Na-phosphate, 150 mM NaCl, pH 7.0
Sample: 5 ml, 2 mg/ml BSA in 20 mM Na-phosphate, 0.5 M NaCl, pH 7.0
Flow rate: 5 ml/min



The blue line corresponds to the absorbance at 280 nm and the red line to conductivity.

Desalting of larger sample volume

Column: WorkBeads Dsalt, 25 × 250 mm (123 ml)
Buffer: PBS, pH 7.4
Sample: 1 mg/ml BSA, 1 M NaCl in PBS, pH 7.4
Sample volume: 30 ml (25 % of CV)
37 ml (30 % of CV)
43 ml (35% of CV)
Flow rate: 25 ml/min (300 cm/h)



The solid lines correspond to absorbance at 280 nm (protein) and the dashed lines to the conductivity (salt).

Technical specifications

	WorkBeads Dsalt
Target substance	Proteins, large peptides (M_r > 5 000), nucleic acids and other biomolecules of similar size
Matrix	Highly cross-linked dextran
Average particle size[1] (D_{v50})	150 µm
Typical sample volume	20 to 30% of the column volume (0.3 CV)
Typical flow rate	150 to 300 cm/h
Chemical stability	Compatible with all standard aqueous buffers used for protein purification, 0.2 M NaOH, 0.2 M HCl, 1 M acetic acid, 8 M urea, 6 M guanidine HCl
pH stability	2 to 12
Storage	2 to 25°C in 20% ethanol or other suitable storage solution
Shipping solution	0.15% ProClin™ 150 in deionized water

[1] *The median particle size of the cumulative volume distribution.*

	BabyBio Dsalt
Target substance	Proteins, large peptides (M_r > 5 000), nucleic acids and other biomolecules of similar size
Matrix	Highly cross-linked dextran
Column volume	1 ml 5 ml
Column dimension	7 × 28 mm (1 ml) 13 × 38 mm (5 ml)
Typical sample volume BabyBio Dsalt 1 ml BabyBio Dsalt 5 ml	 20 to 300 µl 100 to 1500 µl
Recommended flow rate[1] BabyBio Dsalt 1 ml BabyBio Dsalt 5 ml	 0.25 to 1 ml/min (37 to 150 cm/h) 1.25 to 5 ml/min (56 to 225 cm/h)
Maximum flow rate[2] BabyBio Dsalt 1 ml BabyBio Dsalt 5 ml	 5 ml/min (780 cm/h) 12 ml/min (540 cm/h)
Maximum back pressure	0.3 MPa, 3 bar, 43 psi
Chemical stability	Compatible with all standard aqueous buffer used for protein purification
pH stability	2 to 12
Storage	2 to 25°C in 20% ethanol

[1] *Optimal flow is depending on the sample. During column wash, a flow rate of 1 ml/min and 5 ml/min can be used for 1 ml and 5 ml columns, respectively. Note: The maximum pressure the packed bed can withstand depends on the sample/liquid viscosity and chromatography resin characteristics. The pressure also depends on the tubing used to connect the column and the system restrictions after the column outlet.*

[2] *Maximum flow rate for aqueous buffers at 20°C. Decrease the maximum flow rate if the liquid has a higher viscosity. Higher viscosities can be caused by low temperature (use half of the maximum flow rate for 20% ethanol).*

Ordering information

Product name	Pack size	Article number
WorkBeads Dsalt	300 ml	40 360 003
	1 L	40 360 010
	5 L	40 360 050
	10 L	40 360 060
BabyBio Dsalt 1 ml	1 ml × 1	45 360 101
	1 ml × 2	45 360 102
	1 ml × 5	45 360 103
	1 ml × 10	45 360 104
	1 ml × 100	45 360 110
BabyBio Dsalt 5 ml	5 ml × 1	45 360 105
	5 ml × 2	45 360 106
	5 ml × 5	45 360 107
	5 ml × 10	45 360 108
	5 ml × 100	45 360 109

More information

Data Sheet, DS 40 360 010
WorkBeads Dsalt, BabyBio Dsalt

www.bio-works.com/product/sec-resin

Pre-activated resins

Pre-activated resin enables successful, convenient immobilization of ligands without the need for complex syntheses or special equipment. We have developed two different pre-activated resins where the bromohydrin active group reacts with thiol, amino and hydroxyl groups of the substance to be coupled. Two different resin porosities are available to facilitate optimized coupling of ligands of different sizes, or to optimize the prepared affinity resin for target molecules of different sizes.

Target molecules

To prepared customized chromatography resin by coupling substances with thiol, amino and hydroxyl groups.

WorkBeads 40/1000 ACT
WorkBeads 40/10 000 ACT

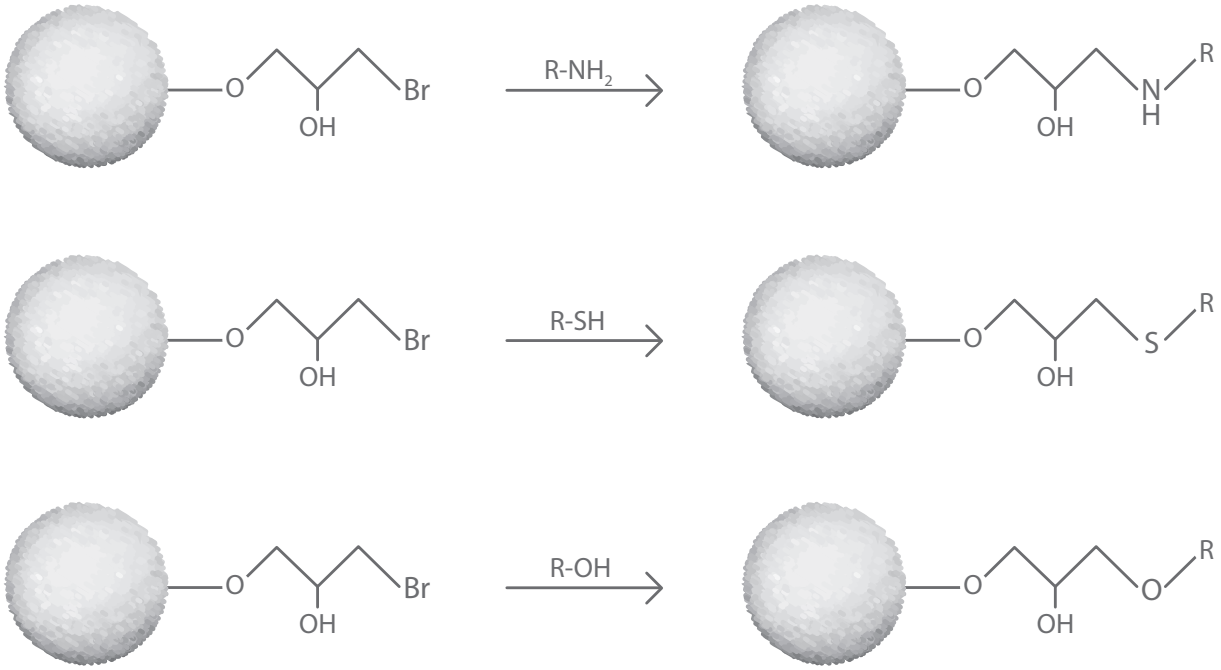
- Ideal for coupling of specific customer designed resins
- Stable covalent linkage
- Suitable for coupling of ligands containing thiol, amino and hydroxyl groups
- Two different porosities for optimized results

BabyBio ACT

- 1 ml and 5 ml prepacked columns with WorkBeads 40/1000 ACT
- Convenient and reliable coupling procedure
- Easy to use with a syringe or chromatography system

Applications

Reaction scheme for coupling from top to bottom, primary amine, thiol and alcohol to bromohydrin activated resin.



Type of ligand and most suitable coupling conditions

Type of ligand	Functional group of ligand	Coupling conditions
Organic molecules, peptides	Thiol (Sulfhydryl) (-SH)	pH > 7 and higher
Organic molecules, peptides	Amines[1] (-NH_2, -NH, -N)	pH > 8 and higher[2]
Proteins, polypeptides	Thiol (Sulfhydryl) (-SH)	pH 7 and higher
Proteins, polypeptides	Primary amino (-NH_2)	Carbonate buffer pH 8 and higher[3]
Substance stable at high pH	Hydroxyl (-OH)	pH > 12[4]

[1] *Substances containing primary, secondary and tertiary amines.*
[2] *Alkaline ligands used in excess may give high enough pH for the reaction to take place. Dissolve it in distilled water and let the basicity of the ligand determine the coupling pH.*
[3] *Sufficient coupling without denaturation of sensitive polypeptides and proteins. Coupling reaction at a lower temperature is also possible.*
[4] *High pH is required due to the low nucleophilicity of the hydroxyl group.*

Technical specifications

	WorkBeads 40/1000 ACT	WorkBeads 40/10 000 ACT
Matrix	Rigid, highly cross-linked agarose	Rigid, highly cross-linked agarose
Average particle size[1] (D_{v50})	45 µm	45 µm
Reactive groups	Bromohydrin	Bromohydrin
Exclusion limit	1200 kDa (globular proteins)	10 000 kDa (globular proteins)
Maximum flow rate[2]	600 cm/h	600 cm/h
Reactive-groups content	200 µmol/ml	200 µmol/ml
Chemical stability (before coupling[3])	Buffers pH < 8.0	Buffers pH < 8.0
Chemical stability (after coupling[4])	Compatible with all standard aqueous buffers used for protein purification, 1 M NaOH, 30% isopropanol or 70% ethanol. Should not be stored at < pH 3 for prolonged time.	
pH stability[4]	2 to 13 (after coupling)	2 to 13 (after coupling)
Storage[5]	2 to 25°C in 20% ethanol	2 to 25°C in 20% ethanol

1 *The median particle size of the cumulative volume distribution.*
2 *Determined in water using a 10 × 300 mm column. Note: When doing a purification the optimal flow rate during binding is depending on the sample.*
3 *Avoid substances containing thiol and amino groups. Substances containing hydroxyl groups will only react if deprotonated. The unreacted resin is generally stable in alcohols at neutral pH.*
4 *Agarose matrix and linker. Stability of the coupled substance may differ.*
5 *The choice of storage conditions for the coupled resin depends on the nature of the ligand.*

	BabyBio ACT
Resin	WorkBeads 40/1000 ACT
Matrix	Rigid, highly cross-linked agarose
Average particle size[1] (D_{v50})	45 µm
Exclusion limit	1200 kDa (globular proteins)
Reactive group	Bromohydrin
Reactive-groups content	200 µmol/ml resin
Column volume	1 ml and 5 ml
Column dimension	7 × 28 mm (1 ml) 13 × 38 mm (5 ml)
Recommended flow rate[2]	
BabyBio 1 ml	0.25 to 1 ml/min (37 to 150 cm/h)
BabyBio 5 ml	1.25 to 5 ml/min (56 to 225 cm/h)
Maximum flow rate[3]	
BabyBio 1 ml	5 ml/min (780 cm/h)
BabyBio 5 ml	20 ml/min (900 cm/h)
Maximum back pressure	0.3 MPa, 3 bar, 43 psi
Chemical stability (before coupling[4])	Buffers pH < 8.0
Chemical stability (after coupling[5])	Compatible with all standard aqueous buffers used for protein purification, 1 M NaOH, 30% isopropanol or 70% ethanol. Should not be stored at < pH 3 for prolonged time.
pH stability[5]	2 to 13 (after coupling)
Storage[6]	2 to 25°C in 20% ethanol

1 *The median particle size of the cumulative volume distribution.*
2 *Optimal flow rate during binding is depending on the sample. During column wash and elution, a flow rate of 1 ml/min and 5 ml/min can be used for 1 ml and 5 ml columns, respectively. Note: The maximum pressure the packed bed can withstand depends on the sample/liquid viscosity and chromatography resin characteristics. The pressure also depends on the tubing used to connect the column and the system restrictions after the column outlet.*
3 *Aqueous buffers at 20°C. Decrease the maximum flow rate if the liquid has a higher viscosity. Higher viscosities can be caused by low temperature (use half of the maximum flow rate at 4°C), or by additives (e.g. use half of the maximum flow rate for 20% ethanol).*
4 *Avoid substances containing thiol and amino groups. Substances containing hydroxyl groups will only react if deprotonated. The unreacted resin is generally stable in alcohols at neutral pH.*
5 *Agarose matrix and linker. Stability of the coupled substance may vary.*
6 *The choice of storage conditions for the coupled resin depends on the nature of the ligand. Often 20% ethanol can be used as a bacteriostatic agent.*

Ordering information

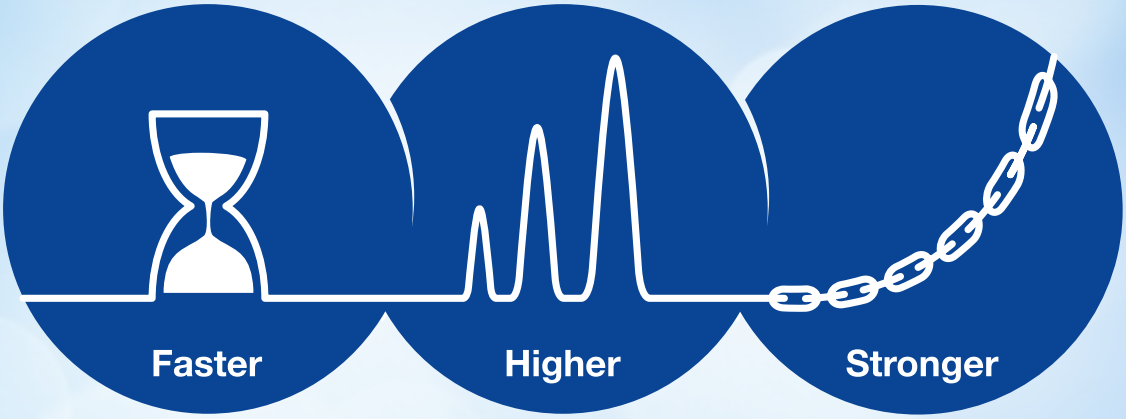
Product name	Pack size	Article number
WorkBeads 40/1000 ACT	50 ml	40 400 001
	300 ml	40 400 003
	1 L	40 400 010
	5 L	40 400 050
WorkBeads 40/10 000 ACT	50 ml	40 450 001
	300 ml	40 450 003
	1 L	40 450 010
	5 L	40 450 050
BabyBio ACT 1 ml	1 ml × 1	45 400 001
	1 ml × 2	45 400 002
	1 ml × 5	45 400 003
	1 ml × 10	45 400 004
BabyBio ACT 5 ml	5 ml × 1	45 400 005
	5 ml × 2	45 400 006
	5 ml × 5	45 400 007
	5 ml × 10	45 400 008

More information

Data Sheet, DS 40 400 010
WorkBeads 40/1000 ACT, WorkBeads 40/10 000 ACT, BabyBio ACT

www.bio-works.com/product/activated-resin

Bio-Works



Flow rate Binding capacity Beads

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Sweden

To purchase Bio-Works products contact Bio-Works, your local distributor or visit the web.
www.bio-works.com

Bio-Works believes in sustainability and care about the environment.
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