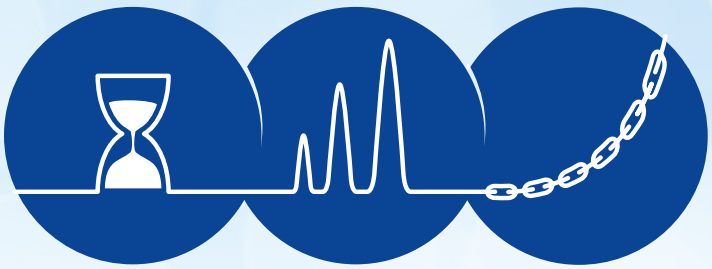
Bio-Works



Bio-Works products

Research & Laboratory | Process Development | Bioprocess Production

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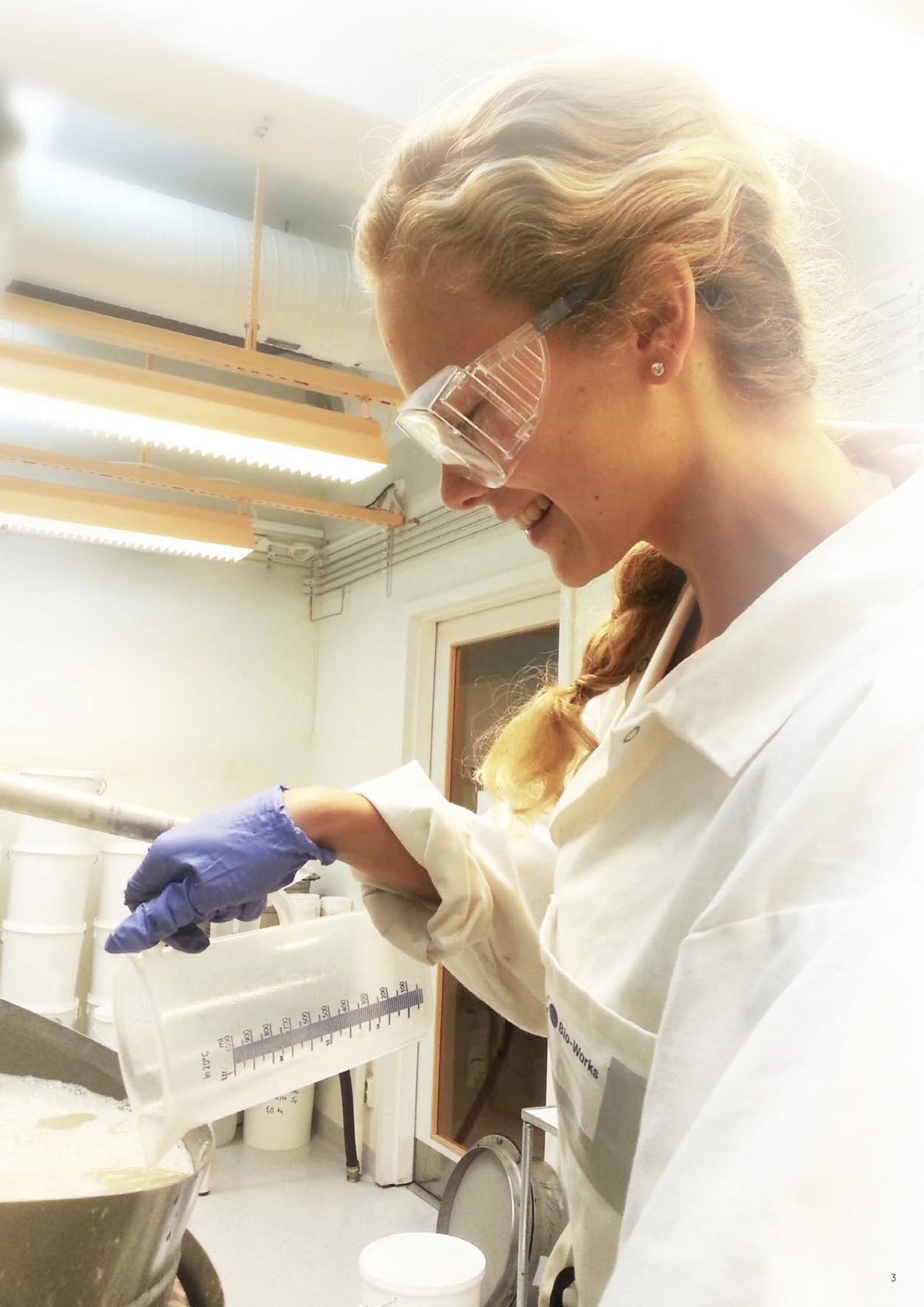
Content


Bio-Works

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 processes follow a Quality Management System (QMS) based on standards of ISO 9001:2008, which is migrating to 9001:2015 during 2018.

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

- Precharged and uncharged IMAC resins
- High selectivity, purity and yield
- NTA and IDA chelating ligands

Viruses and vaccines

WorkBeads 40/10 000 SEC

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

Peptides

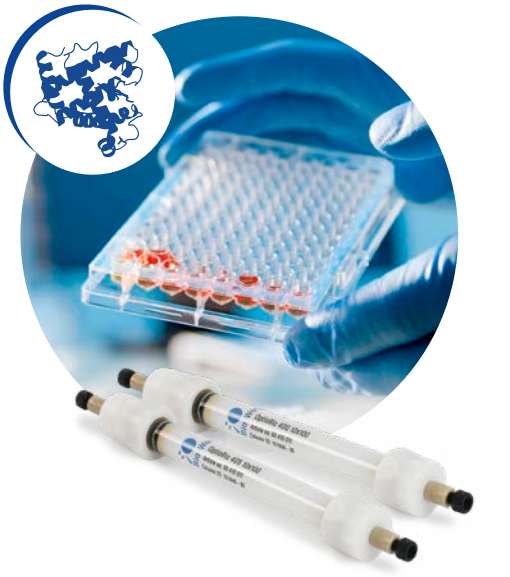
WorkBeads 40S and WorkBeads 40Q

- 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

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



Proteins & enzymes

WorkBeads 40S and WorkBeads 40Q

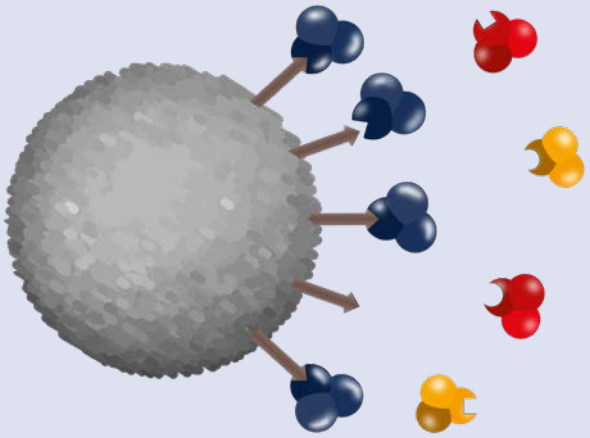
- From capture to polishing
- Lower pressure with efficient purification
- High dynamic binding capacities at short residence times

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

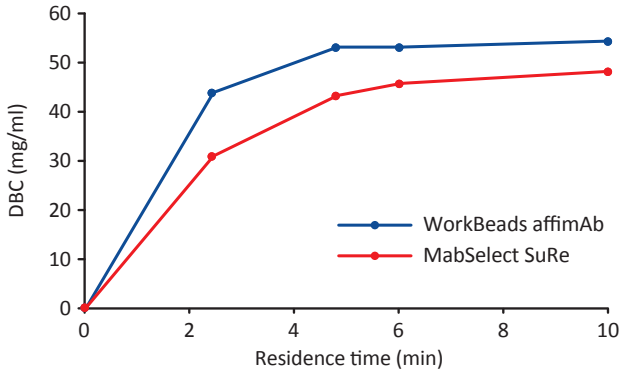
WorkBeads Protein A

- 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™ (GE Healthcare)
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)

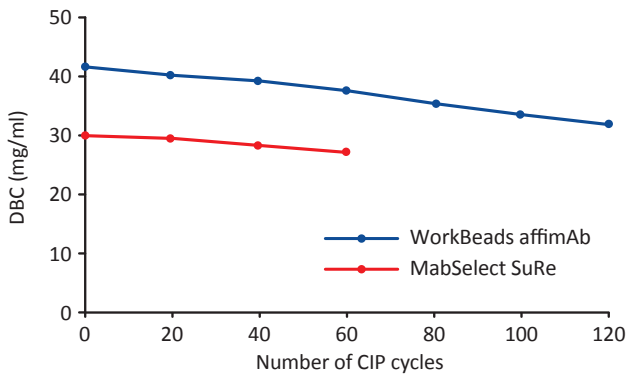
DBC (10% breakthrough) determined at start and after each 20th CIP cycle

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:

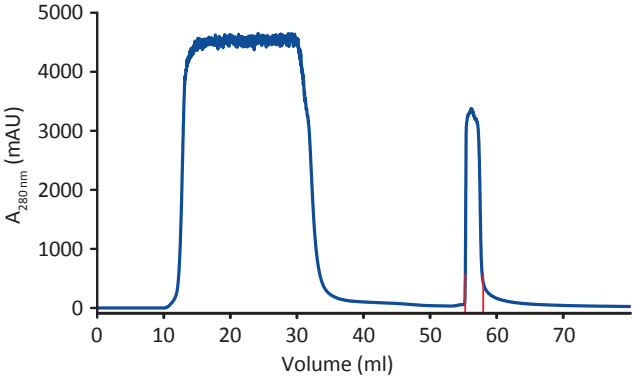
1. 5 CV PBS, pH 7.4 at 1.4 ml/min (2.4 min RT)
2. 0.5 M NaOH, 15 min contact time at 1 ml/min
3. 5 CV PBS, pH 7.4 at 1.4 ml/min
4. 5 CV 0.1 M glycine-HCl, pH 2.7 at 1.4 ml/min
5. 5 CV PBS, pH 7.4 at 1.4 ml/min

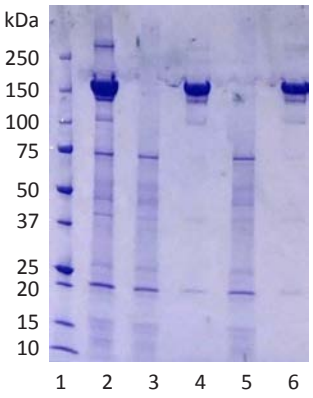
0.5 M NaOH, 15 min contact time for 120 cycles



Purification of mAb from CHO cells

Resins:	WorkBeads affimAb MabSelect SuRe
Sample:	18 ml clarified cell supernatant from CHO cells
Binding buffer:	PBS, pH 7.4
Elution buffer:	0.1 M glycine-HCl, pH 2.7
Column volume:	3.4 ml (6.6 x 100 mm)
Flow rates:	
Binding:	0.6 ml/min (100 cm/h)
Elution:	0.8 ml/min (150 cm/h)
Wash:	1.7 ml/min (300 cm/h)





Lanes:
1. M_r marker
2. Sample
3. WorkBeads affimAb, flow through
4. WorkBeads affimAb, eluted pool
5. MabSelect SuRe, flow through
6. MabSelect SuRe, eluted pool

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	250 cm/h
Chemical stability	Compatible with all standard aqueous buffers used for protein purification, 0.5 mM 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 BabyBio 1 ml BabyBio 5 ml	 0.5 to 1 ml/min (75 to 150 cm/h) 1 to 4 ml/min (45 to 180 cm/h)	 0.5 to 1 ml/min (75 to 150 cm/h) 1 to 4 ml/min (45 to 180 cm/h)
Maximum flow rate[3] BabyBio 1 ml BabyBio 5 ml	 4 ml/min (620 cm/h) 15 ml/min (670 cm/h)	 4 ml/min (620 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] *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] *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	1.5 ml	40 605 001
	5 ml	40 605 002
	10 ml	40 605 003
	100 ml	40 605 004
	1 L	40 605 005
BabyBio A 1 ml	1 ml x 1	45 605 101
	1 ml x 2	45 605 102
	1 ml x 5	45 605 103
	1 ml x 10	45 605 104
BabyBio A 5 ml	5 ml x 1	45 605 105
	5 ml x 2	45 605 106
	5 ml x 5	45 605 107
	5 ml x 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

Data Sheet, DS 45 605 010
BabyBio A

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

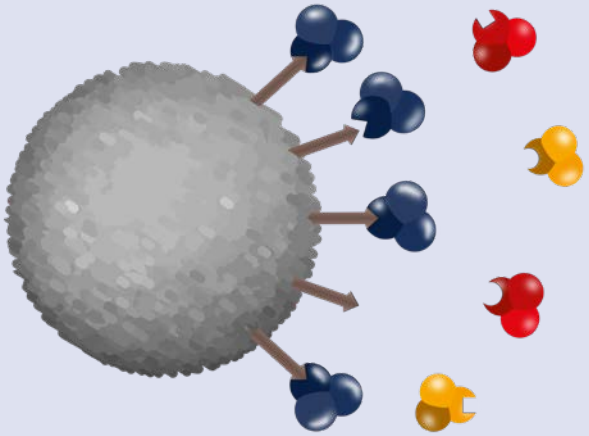
Immobilized metal ion affinity chromatography

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 resins

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

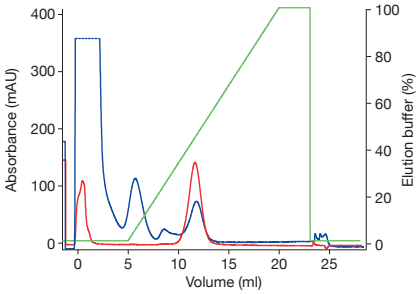
- Prepacked for fast and reproducible purifications
- 1 ml and 5 ml columns with precharged WorkBeads NTA or WorkBeads IDA resins
- Easy to use with a syringe or chromatography system

Applications

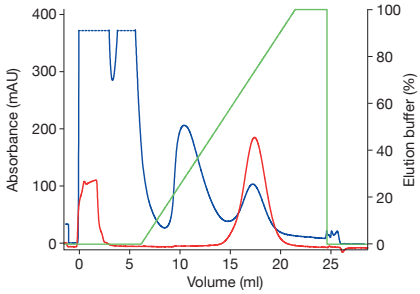
Using BabyBio NTA His-tag Screening kit and BabyBio IDA His-tag Screening to find the optimal purification method

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)

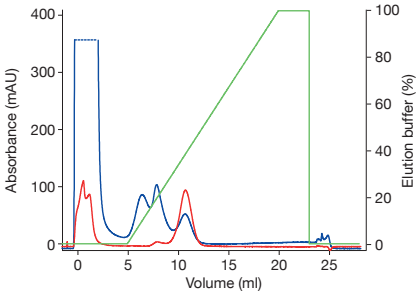
BabyBio Ni-NTA 1 ml



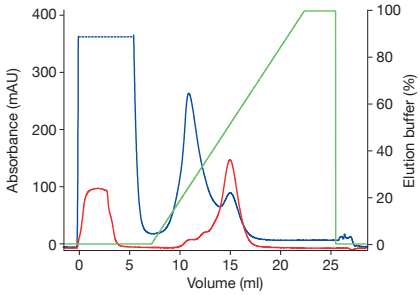
BabyBio Ni-IDA 1 ml



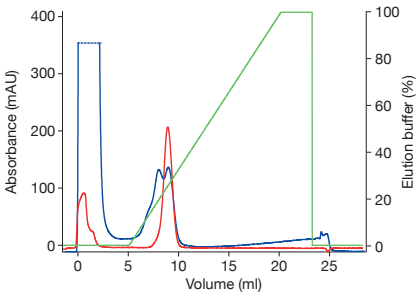
BabyBio Co-NTA 1 ml



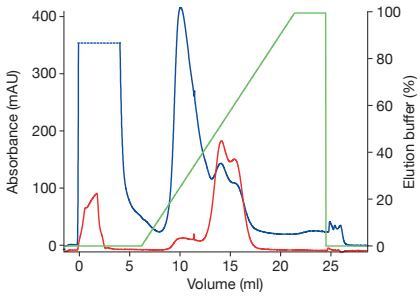
BabyBio Co-IDA 1 ml



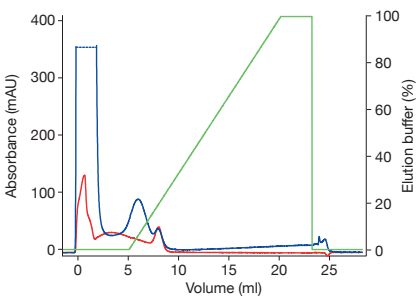
BabyBio Cu-NTA 1 ml



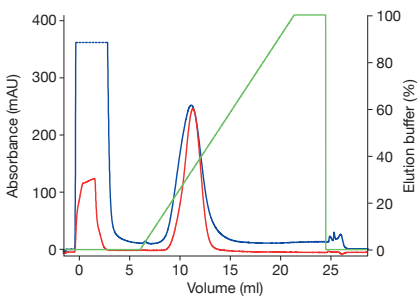
BabyBio Cu-IDA 1 ml



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.

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

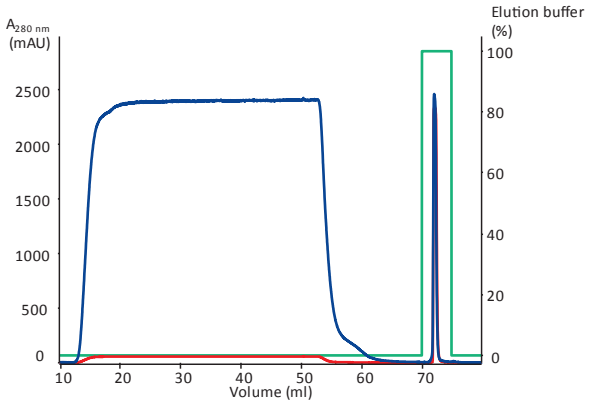
- Prepacked for fast and reproducible purifications
- 1 ml and 5 ml columns with WorkBeads NTA or WorkBeads IDA
- Fast and convenient to immobilize your choice of metal ions
- Easy to use with a syringe or chromatography system

Applications

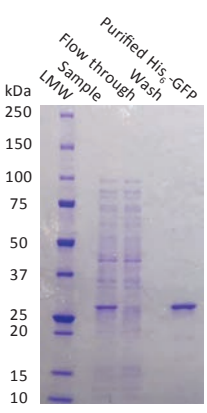
Purification of clarified His_6-GFP on BabyBio Ni-NTA

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, flowthrough, wash and eluted peak.

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 BabyBio 1 ml BabyBio 5 ml	 1 ml/min (150 cm/h) 5 ml/min (225 cm/h)	 1 ml/min (150 cm/h) 5 ml/min (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) 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] *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]	50 to 60 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 x 28 mm (1 ml) 13 x 38 mm (5 ml)	7 x 28 mm (1 ml) 13 x 38 mm (5 ml)
Recommended flow rates BabyBio 1 ml BabyBio 5 ml	 1 ml/min (150 cm/h) 5 ml/min (225 cm/h)	 1 ml/min (150 cm/h) 5 ml/min (225 cm/h)
Maximum flow rate[2] 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] *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 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 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
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

[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 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 40 650 010

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

Data Sheet, DS 45 655 010

BabyBio IMAC columns

Data Sheet, DS 45 700 010

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 x 1 1 ml x 2 1 ml x 5 1 ml x 10	45 655 111 45 655 112 45 655 113 45 655 114
BabyBio NTA 5 ml	5 ml x 1 5 ml x 2 5 ml x 5 5 ml x 10	45 655 115 45 655 116 45 655 117 45 655 118
BabyBio IDA 1 ml	1 ml x 1 1 ml x 2 1 ml x 5 1 ml x 10	45 655 011 45 655 012 45 655 013 45 655 014
BabyBio IDA 5 ml	5 ml x 1 5 ml x 2 5 ml x 5 5 ml x 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

Data Sheet, DS 45 655 010
BabyBio IMAC columns

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

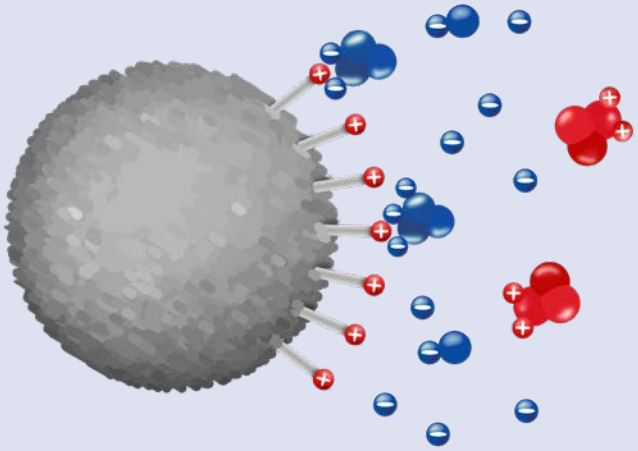
Ion exchange chromatography

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.

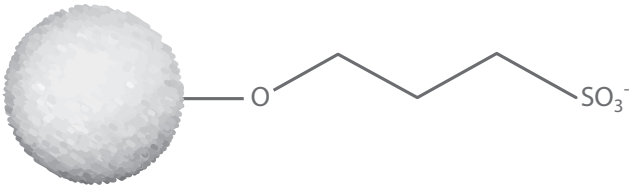


Schematic depicting ion exchange chromatography

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

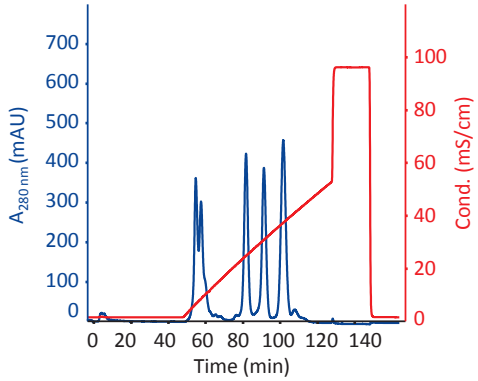
Applications

Comparison of prepacked cation exchangers

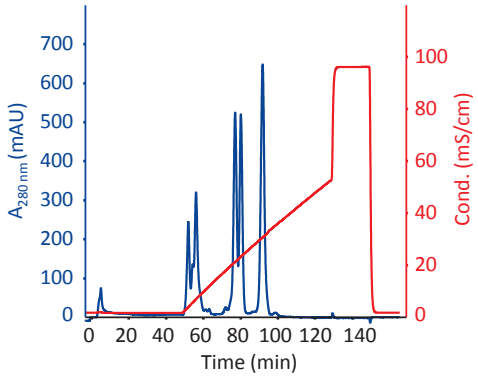
Prepacked column:	OptioBio 40S 10x100
Resin:	WorkBeads 40S
Sample:	2.5 ml 1.5 mg/ml Concanavalin A, 1.5 mg/ml Ribonuclease A, 0.5 mg/min α-chymotrypsinogen A, 0.5 mg/ml Lysozyme
Binding buffer:	50 mM MES, pH 6.0
Elution buffer:	0-50% in 20 CV 50 mM MES, 1 M NaCl, pH 6.0
Flow rate:	2 ml/min, 150 cm/h,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

Prepacked column:	HiScreen™ Capto™ SP ImpRes (GE Healthcare)
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 Na^+/ml resin	180 to 250 µmol Na^+/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	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 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 Na^+/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

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 Na^+/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 BabyBio 1 ml BabyBio 5 ml	 1 ml/min (150 cm/h) 5 ml/min (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)
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

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 *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

Product name	Pack size	Article number
OptioBio 40S 10x100	7.9 ml × 1	55 420 011
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

More information

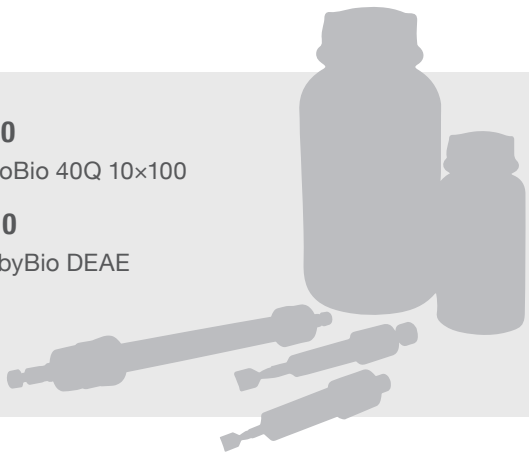
Data Sheet, DS 40 100 010
WorkBeads 40S, WorkBeads 40Q

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

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

Data Sheet, DS 45 100 010
BabyBio S, BabyBio Q, BabyBio DEAE

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



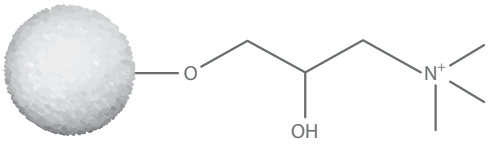
Anion exchangers

Target molecules

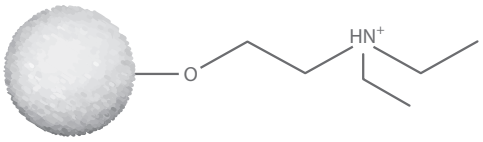
In general most proteins and peptides. IEX is a universal purification technique suitable in all purification steps in a process. Anion exchangers are also excellent for purification of oligonucleotides.

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

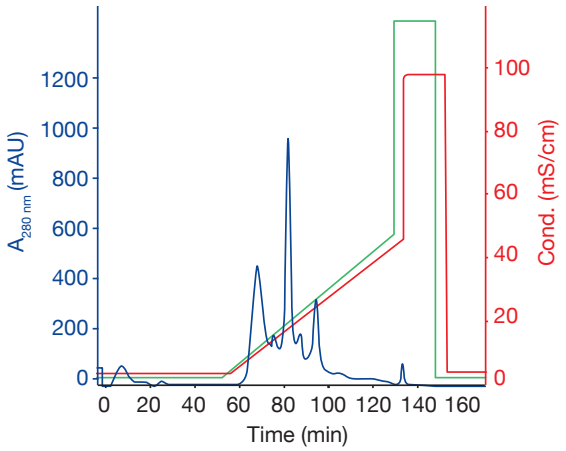
Applications

Comparison of prepacked anion exchangers

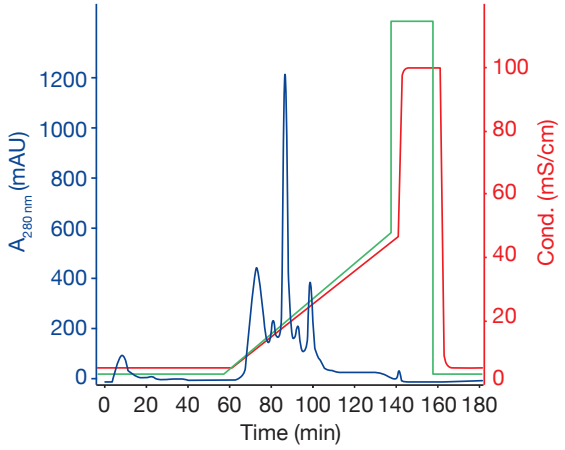
Prepacked column:	OptioBio 40Q 10x100
Resin:	WorkBeads 40Q
Sample:	10 ml 0.7 mg/ml apo-transferrin, 0.45 mg/ml α-lactalbumin, 1.4 mg/ml soybean trypsin inhibitor
Binding buffer:	50 mM Tris-HCl, pH 7.4
Elution buffer:	0-40% over 20 CV, 50 mM Tris-HCl, 1 M NaCl pH 7.4
Flow rate:	2 ml/min, 150 cm/h, 4 min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

Prepacked column:	HiScreen Capto Q ImpRes (GE Healthcare)
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	BabyBio 1 ml, 1 ml/min (150 cm/h) BabyBio 5 ml, 5 ml/min (225 cm/h)	2 to 4 ml/min (150 to 300 cm/h)
Maximum flow rate[3]	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] *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	N/A	BabyBio 1 ml, 1 ml/min (150 cm/h) BabyBio 5 ml, 5 ml/min (225 cm/h)
Maximum flow rate[3]	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, 50 mM NaCl, pH 8.0.*
[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).*

Ordering information

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

More information

Data Sheet, DS 40 100 010
WorkBeads 40S, WorkBeads 40Q

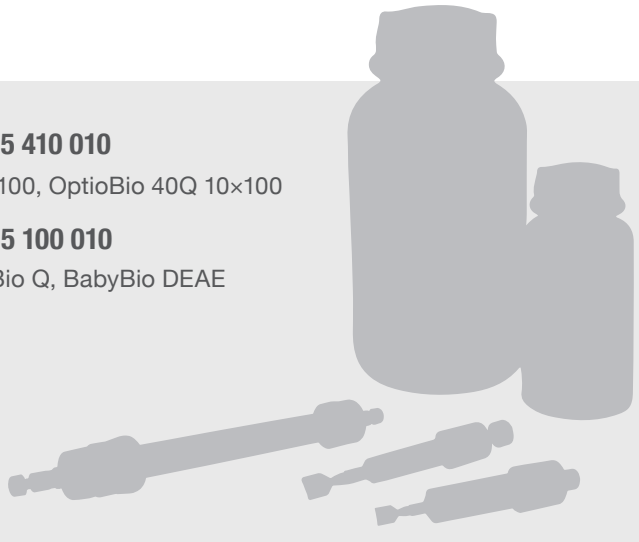
Data Sheet, DS 10 200 010
WorkBeads 100S, WorkBeads 100Q

Data Sheet, DS 40 100 020
WorkBeads 40 DEAE

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

Data Sheet, DS 45 100 010
BabyBio S, BabyBio Q, BabyBio DEAE

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



Multimodal ion exchange chromatography

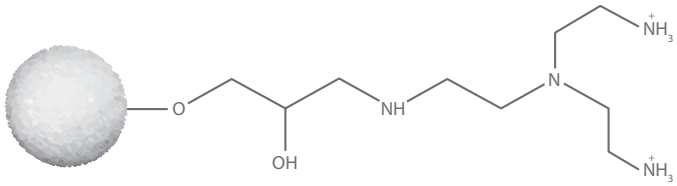
Multimodal ion exchange chromatography is also referred to as mixed-mode ion exchange chromatography. It utilizes the ionic interaction in combination with hydrophobic and other types of interactions. The combined effect gives the resin unique selectivities that adds new possibilities in biomolecule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

Target molecules

Chromatin fragments, proteins, peptides and oligonucleotides.

WorkBeads 40 TREN

- Improved selectivities through multimodal IEX separation
- Reduced fouling of protein A resins by clean up of chromatin and host cell impurities from the feed
- High binding capacity and purity



Structure of the ligand used in WorkBeads 40 TREN

BabyBio TREN

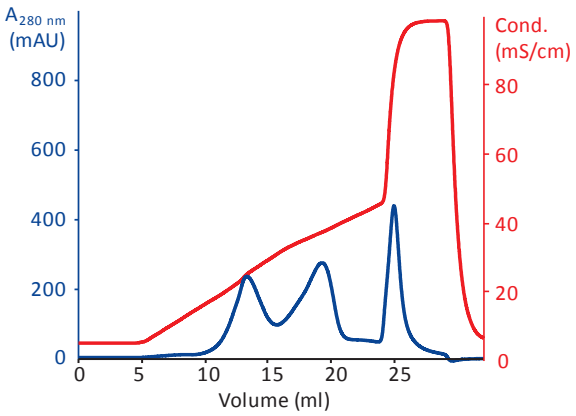
- Prepacked for fast and reproducible purifications
- 1 ml and 5 ml columns with WorkBeads 40 TREN
- Easy to use with a syringe or chromatography system

Applications

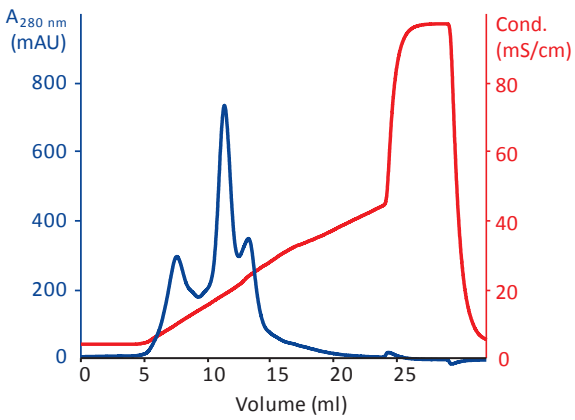
Comparison of prepacked BabyBio TREN and BabyBio DEAE

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

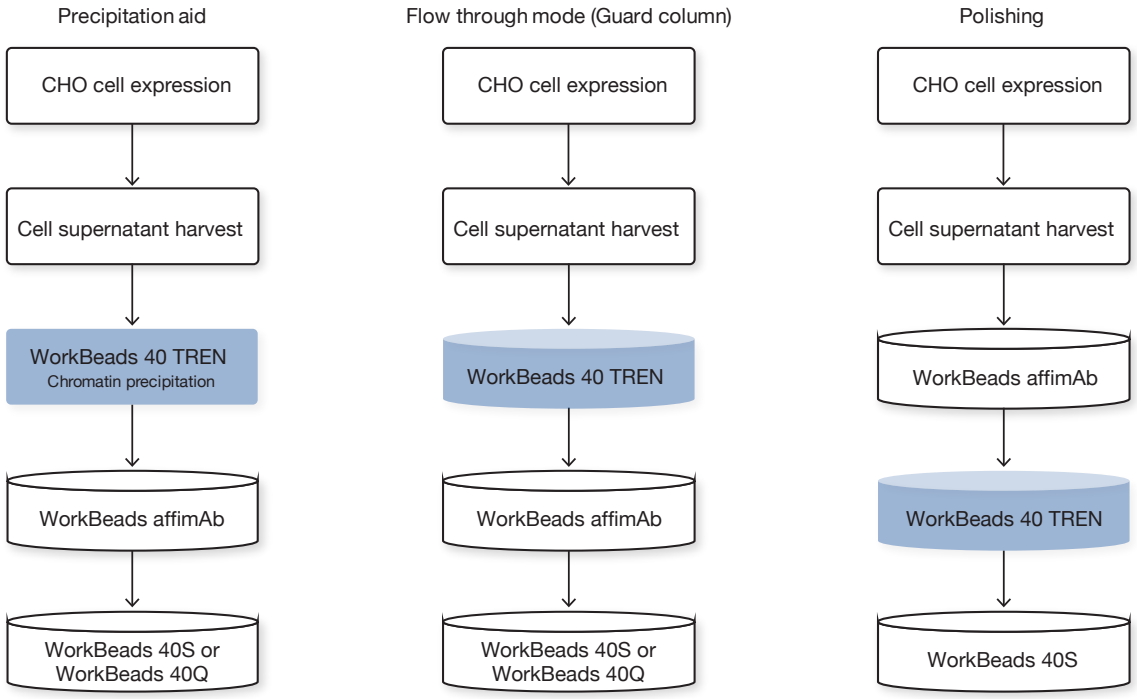


BabyBio DEAE



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.

Use of WorkBeads 40 TREN in mAb purification processes



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)
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.*

	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)
Column volume	1 ml 5 ml
Column dimension	7 × 28 mm (1 ml) 13 × 38 mm (5 ml)
Recommended flow rate BabyBio 1 ml BabyBio 5 ml	 1 ml/min (150 cm/h) 5 ml/min (225 cm/h)
Maximum flow rate[2] 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] *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	40 603 001
	150 ml	40 603 003
	1 L	40 603 010
BabyBio TREN 1 ml	1 ml × 1	45 655 211
	1 ml × 2	45 655 212
	1 ml × 5	45 655 213
	1 ml × 10	45 655 214
BabyBio TREN 5 ml	5 ml × 1	45 655 215
	5 ml × 2	45 655 216
	5 ml × 5	45 655 217
	5 ml × 10	45 655 218

More information

Data Sheet, DS 40 600 020
WorkBeads 40 TREN

Data Sheet, DS 45 655 030
BabyBio TREN

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

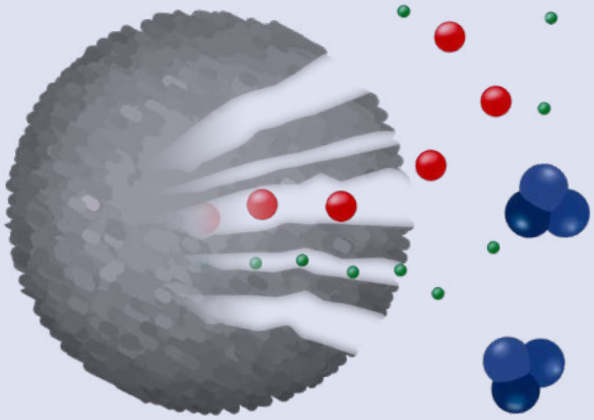
Size exclusion chromatography

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

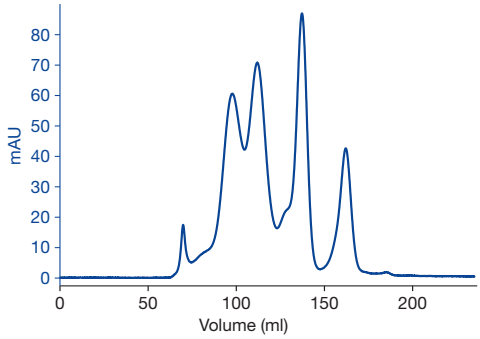
- Produced using a proprietary cross-linking method results in highly porous and physically stable matrices
- Available with three different porosities for optimized separations
- Excellent for purifications of viruses and vaccines
- Resistant to hash cleaning agents (NaOH)

Applications

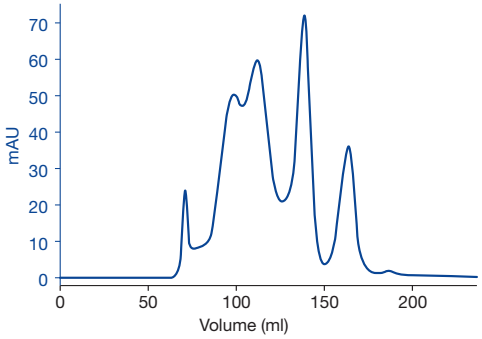
WorkBeads 40/1000 SEC, different flow rates

Resin: WorkBeads 40/1000 SEC
Column: 16 x 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)

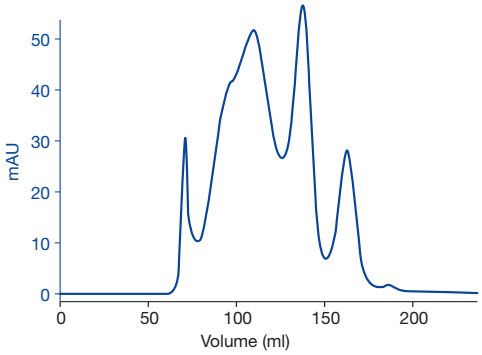
25 cm/h



50 cm/h



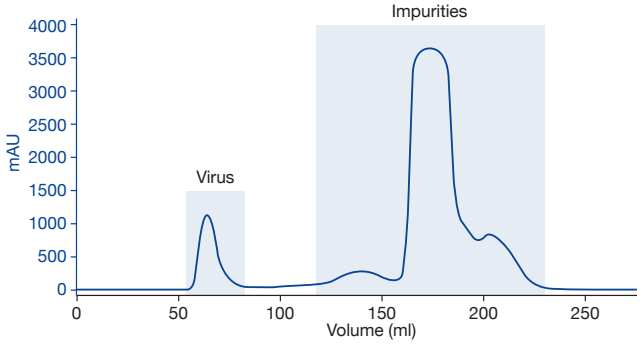
100 cm/h



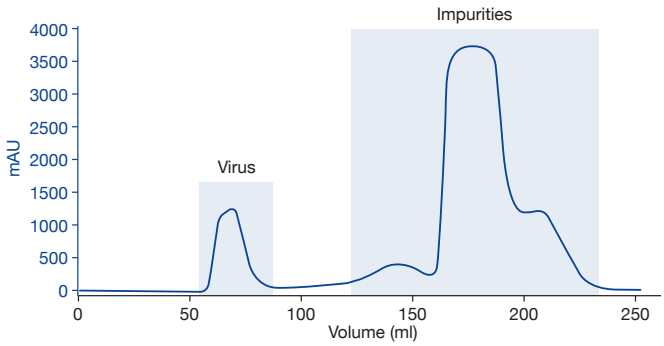
Purification of animal viral vaccine

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	20 to 100 cm/h	20 to 100 cm/h	20 to 50 cm/h
Maximum flow rate[3]	300 cm/h (600 cm/h)	300 cm/h (600 cm/h)	300 cm/h (600 cm/h)
Chemical stability	Compatible with all standard aqueous buffers used for protein purification. Should not be stored below pH 3 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 *16 mm (i.d.) × 900 mm column, or 25 × 200 mm (values within brackets)*

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

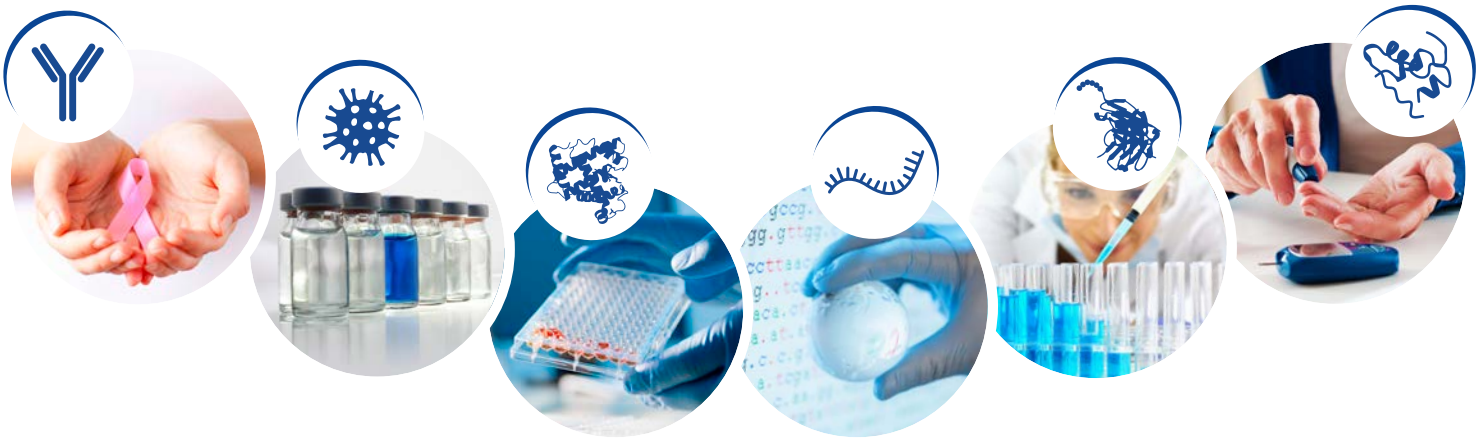
More information

Data Sheet, DS 40 300 010
WorkBeads 40/100 SEC, WorkBeads 40/1000 SEC, WorkBeads 40/10 000 SEC

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

Purification made simple

3rd generation agarose beads



Bio-Works

Faster Higher Stronger

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.

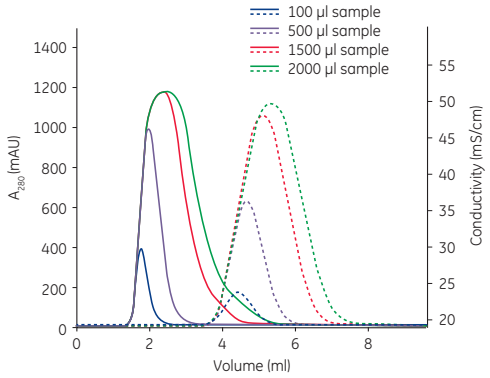
BabyBio Dsalt

- 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 ul to 2000 ul sample

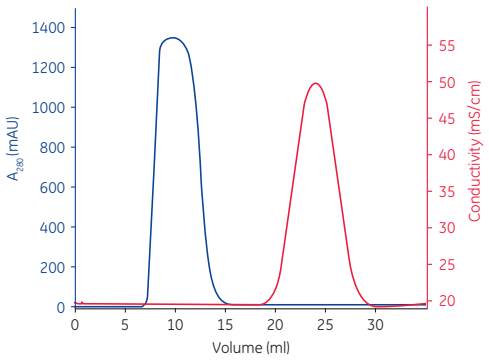
Column: BabyBio Dsalt 5 ml
Buffer: 25 mM Na-phosphate, 150 mM NaCl, pH 7.0
Sample: 2 mg/ml BSA in 20 mM Na-phosphate, 0.5 M NaCl, pH 7.0
Flow rate: 5 ml/min



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

BabyBio 5 ml x 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.

Technical specifications

	BabyBio Dsalt
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 BabyBio Dsalt 1 ml BabyBio Dsalt 5 ml	 1 ml/min (150 cm/h) 5 ml/min (225 cm/h)
Maximum flow rate[1] 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] *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 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 45 360 010
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

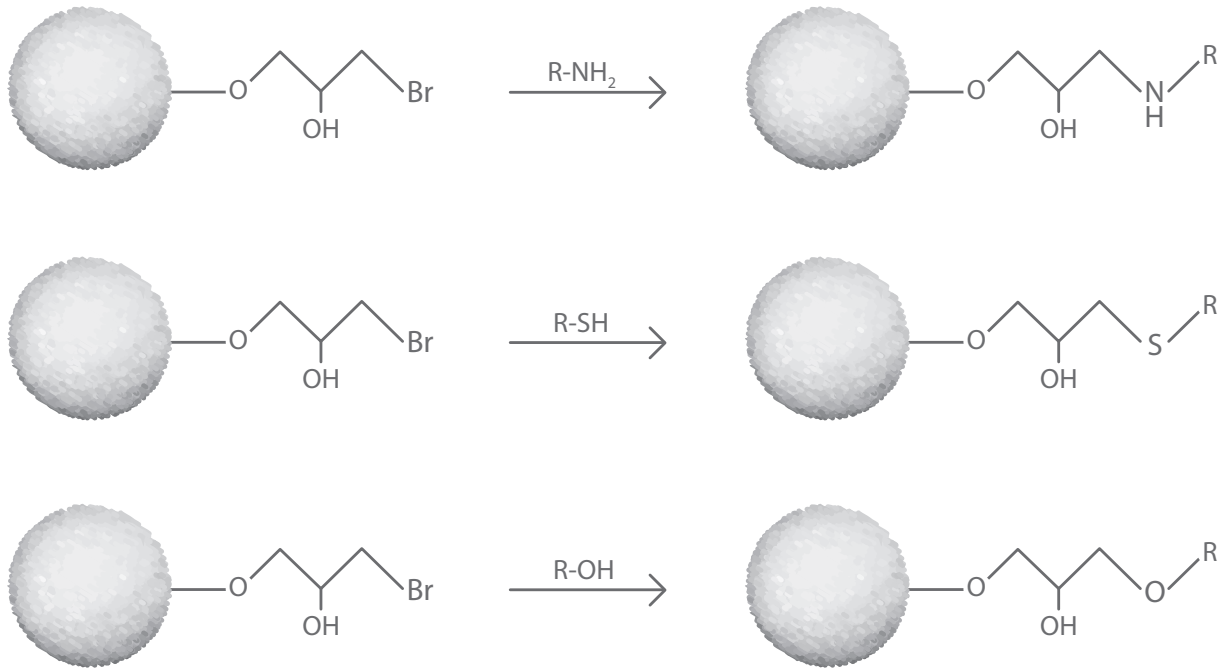
- Ideal for coupling of specific customer designed resins
- Stable covalent linkage
- Suitable for coupling of ligands containing thiol, amino and hydroxyl groups
- Two different porosities for optimized results

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.*
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 BabyBio 1 ml BabyBio 5 ml	 1 ml/min (150 cm/h) 5 ml/min (225 cm/h)
Maximum flow rate[2] 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 (before coupling[3])	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)
Storage[5]	2 to 25°C in 20% ethanol

1 *The median particle size of the cumulative volume distribution.*
2 *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).*
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 vary.*
5 *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

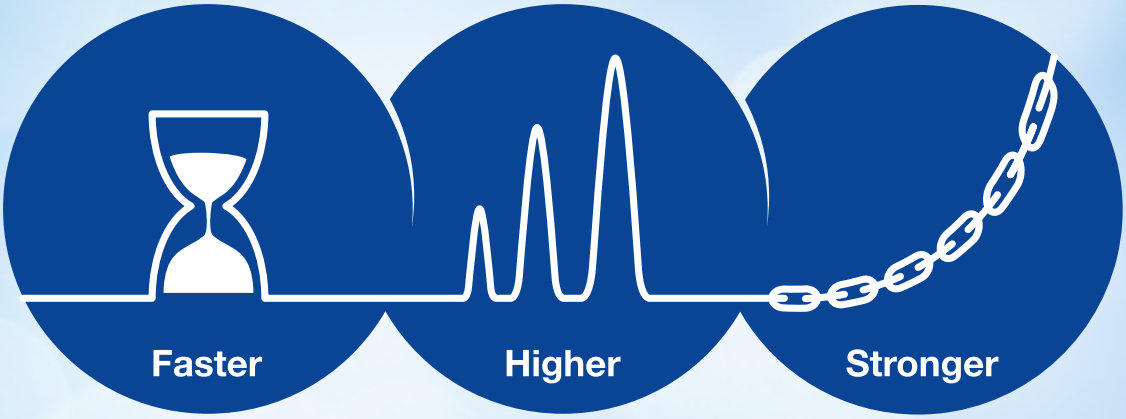
More information

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

Data Sheet, DS 45 400 010
BabyBio ACT

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

Bio-Works



Flow rate Binding capacity Beads

Customer Inquiries

Mail: info@bio-works.com
Phone: +46 8 5626 7430
Web: www.bio-works.com

Company Mailing Address

Bio-Works Technologies AB
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