



ToyoScreen process development columns

ToyoScreen RoboColumns®

TOYOPEARL and TSKgel LabPak media

Resin Seeker 96-well plate kits

MiniChrom columns

TOYOPEARL protein A ELISA kit

TOYOPEARL protein L ELISA kit



**ToyoScreen
RoboColumns**

**ToyoScreen
Columns**

**Resin Seeker
96-Well Plate Kits**

**MiniChrom
Columns**

The Role of Resin Screening in Process Chromatography

Resin screening and selection is an integral part of chromatographic optimization in process manufacturing. Due to the diversity in available ligand chemistries and base matrices offered by different vendors (e.g., agarose, methacrylate, styrene/divinylbenzene, etc.), it is prudent at the first part of the development process to screen as many resins as possible. A thorough evaluation is a necessity as each target molecule has very different physical and chromatographic properties. Very often a resin that worked in the past for a similar molecule will not work as effectively for the new target molecule. In addition, performance parameters such as selectivity, binding capacity, recovery, etc. are mainly influenced by the properties of the chromatographic resin. Therefore, selection of the most suitable resin is the significant key point to succeed in purification.

Tosoh Bioscience offers a wide variety of screening tools composed of TOYOPEARL and TSKgel process media. In addition, bulk media volumes of <1 L are available for process development.

TOYOPEARL and TSKgel Process Media

TOYOPEARL resins are hydrophilic macroporous methacrylic resins for large-scale chromatographic applications. Their rigid polymeric backbone has better pressure-flow properties than most other commercially made materials. Therefore, higher linear operating velocities can be used for faster process throughput and decreased recycling times.

TOYOPEARL resins are stable over the pH 2-12 range for normal operating conditions and pH 1-13 for cleaning conditions. The resins are available in average particle sizes of 35 μm , 65 μm , 75 μm , and 100 μm for high resolution, intermediate purification, or capture chromatography. In most modes, TOYOPEARL is available in three grades: S (superfine) for highest performance, F (fine), and M (medium) for economical purification. Two additional grades, C (coarse) and EC (extra coarse), are available for capture.

TOYOPEARL resins are also offered in many different pore diameters for size exclusion, ion exchange, hydrophobic interaction, mixed-mode, and affinity chromatography. Pore diameter and surface area can be optimized to ensure excellent kinetic access and binding capacity of a target regardless of molecular size.

For predictable results in scale-up, TOYOPEARL resins are based on the same chemistries as the prepacked TSKgel columns. This allows the seamless direct scale-up of methods developed on TSKgel columns to TOYOPEARL resins.

TSKgel resins are larger particle size versions of the chemically equivalent methacrylic packing of analytical scale TSKgel columns. The polymeric resins with particle sizes of 20 μm and 30 μm used in TSKgel columns are also available in bulk quantities for large scale ion exchange and hydrophobic interaction chromatography. Their mechanical stability and permeability make them excellent for use when increased separation performance and plate count are needed for optimum preparative or process chromatography.

ToyoScreen Process Development Columns

In order to improve the efficiency of resin screening experiments, pre-packed process development columns are available from Tosoh Bioscience. The 1 mL and 5 mL ToyoScreen columns are packed with various TOYOPEARL process resins and are a convenient and affordable alternative to self-packing. Advantages of ToyoScreen columns are summarized in [Table 1](#).

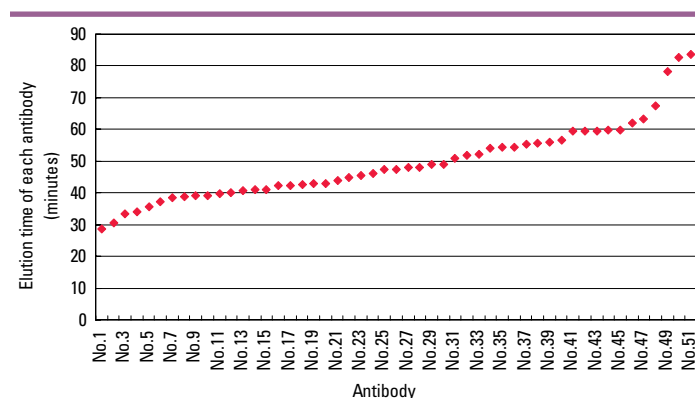
Table 1: Features and benefits of ToyoScreen columns

Features	Benefits
Packed with TOYOPEARL hydrophobic interaction, ion exchange or affinity chemistries	Added flexibility in determining the optimum purification protocol
1 mL and 5 mL formats available	For sample limited applications up to milligram purifications
Cartridge and holder design	Provides a low cost, efficient alternative to self packing with bulk resin
Easy connections with ÄKTA®, FPLC, and even HPLC systems	Seamless integration with any platform
Offered in mixed or single chemistry packages	For cost savings in screening or process optimization experiments

Resin Screening with ToyoScreen Columns

TOYOPEARL hydrophobic interaction media (HIC) is available in six different chemistries ranging in hydrophobicity from Ether-650 (low) to Hexyl-650 (high). Depending on a target's feedstock and impurity profile, the determination of the best selectivity is an empirical process. As shown in [Figure 1](#), hydrophobicities can vary widely within a class of similar biologics like mAbs. [Figure 2](#) shows the selectivity differences of the ToyoScreen HIC chemistries on the separation of protein standards. [Figure 3](#) demonstrates the selectivity differences on the separation of anti-IgG from albumin in mouse ascites fluid.

Figure 1: Hydrophobic diversity of mouse monoclonal antibodies - plot of chromatographic elution times for 51 different mouse monoclonal antibodies



Column: TSKgel Phenyl-5PW

Mobile phase: Buffer A: 0.1 mol/L phosphate buffer + 1.8 mol/L ammonium sulfate, pH 7.0

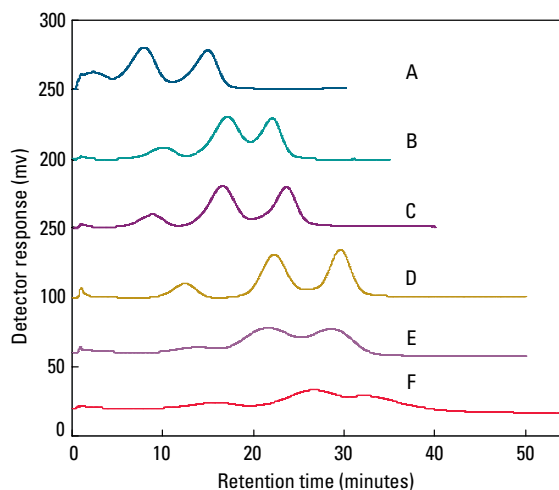
Buffer B: 0.1 mol/L phosphate buffer, pH 7.0

Gradient: 65 minutes, 0 - 100% B

Flow rate: 1 mL/min

Samples: 51 unique mouse monoclonal antibodies

Figure 2: Screening of TOYOPEARL HIC resins with standard proteins



Resins: A. TOYOPEARL Ether-650M
B. TOYOPEARL PPG-600M
C. TOYOPEARL Phenyl-650M
D. TOYOPEARL Butyl-650M
E. TOYOPEARL SuperButyl-550C
F. TOYOPEARL Hexyl-650C

Column size: ToyoScreen, 1 mL

Mobile phase: Buffer A: 0.1 mol/L phosphate buffer + 1.8 mol/L sodium sulfate, pH 7.0

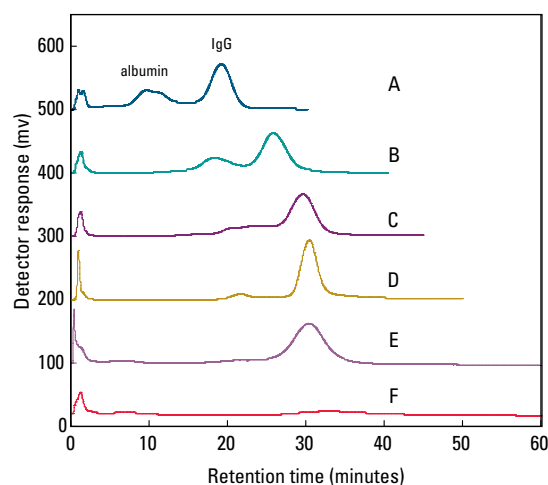
Buffer B: 0.1 mol/L phosphate buffer, pH 7.0

Gradient: 30 min linear gradient buffer A to buffer B

Flow rate: 1 mL/min

Samples: ribonuclease A, lysozyme, α -chymotrypsinogen, 1 mg/mL each

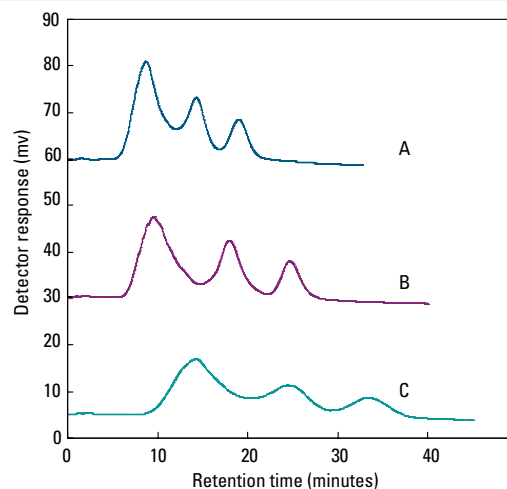
Figure 3: Screening of TOYOPEARL HIC resins with mouse ascites fluid (Anti-IgE)



Resins:
A. TOYOPEARL Ether-650M
B. TOYOPEARL PPG-600M
C. TOYOPEARL Phenyl-650M
D. TOYOPEARL Butyl-650M
E. TOYOPEARL SuperButyl-550C
F. TOYOPEARL Hexyl-650C

Column size: ToyoScreen, 1 mL
Mobile phase: Buffer A: 0.1 mol/L phosphate buffer + 1.8 mol/L sodium sulfate, pH 7.0
 Buffer B: 0.1 mol/L phosphate buffer, pH 7.0
Gradient: 30 min linear gradient buffer A to buffer B
Flow rate: 1 mL/min
Samples: mouse ascites fluid: A:B = 1:1:2

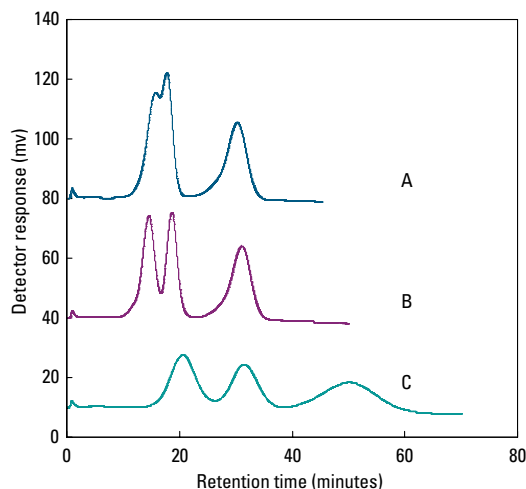
Figure 4: Screening of TOYOPEARL anion exchange resins with standard proteins



Resins:
A. TOYOPEARL DEAE-650M
B. TOYOPEARL SuperQ-650M
C. TOYOPEARL QAE-550C

Column size: ToyoScreen, 1 mL
Mobile phase: Buffer A: 20 mmol/L Tris-HCl, pH 8.0
 Buffer B: 20 mmol/L Tris-HCl + 0.5 mol/L NaCl, pH 8.0
Gradient: 60 minutes, 0 - 100% B
Flow rate: 1 mL/min
Samples: transferrin, ovalbumin, trypsin inhibitor, 1 mg/mL each

Figure 5: Screening of TOYOPEARL cation exchange resins with standard proteins



Resins:
A. TOYOPEARL CM-650M
B. TOYOPEARL SP-650M
C. TOYOPEARL SP-550C

Column size: ToyoScreen, 1 mL
Mobile phase: Buffer A: 20 mmol/L phosphate buffer, pH 6.0
 Buffer B: 20 mmol/L phosphate buffer + 0.5 mol/L NaCl, pH 6.0
Gradient: 60 minutes, 0 - 100% B
Flow rate: 1 mL/min
Samples: α-chymotrypsinogen A, cytochrome C, lysozyme, 1 mg/mL each

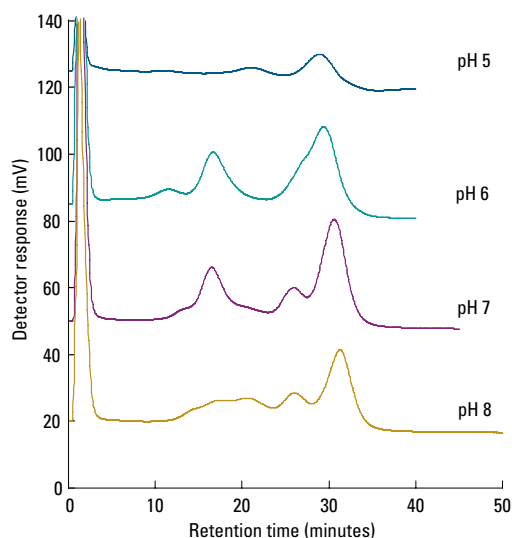
Ion exchange chromatography (IEX) separates molecules based on the ionic interaction of the molecule with the charged support. The individual functional group and its pKa can be used to evaluate different selectivities in chromatographic separations. ToyoScreen columns are offered in both strong and weak functionalities for both cation and anion ligand types. Figures 4 and 5 detail the effect on the separation for the available TOYOPEARL anion and cation exchange chemistries when screening protein standards.

In affinity chromatography (**AFC**), the ligands employed are specific to a particular protein class or functional group on the accessible surface of the target molecule. ToyoScreen affinity columns are offered in three group specific ligand chemistries: AF-rProtein A-650F, AF-Chelate-650M, and AF-Red 650ML. AF-rProtein A-650F is used for the purification of monoclonal antibodies. AF-Red-650ML is specific for dehydrogenases and other proteins such as plasminogen. AF-Chelate-650M can be converted to either the Ni^{++} or Ca^{++} form. When converted to the Ni^{++} form it is an excellent resin for metal ligand affinity for molecules containing His-tags. ToyoScreen affinity columns allow for the quick assessment of optimum binding conditions for any of these columns.

Method Optimization

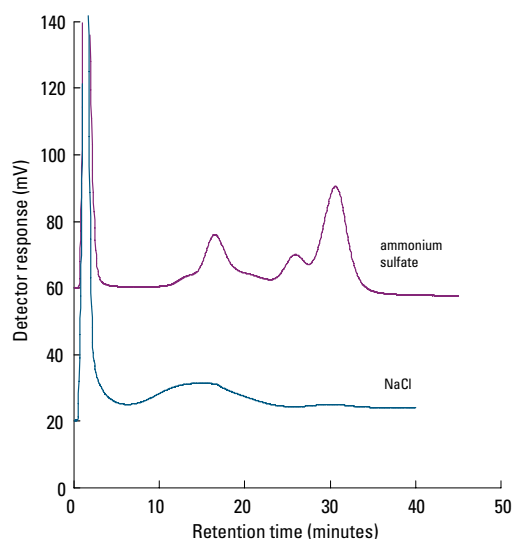
Beyond the determination of “what sticks” during resin screening experiments, ToyoScreen columns can be used to quickly establish optimum elution conditions. Varying pH, salt type, salt gradients, and flow rate are common experimental parameters explored. The effect of varying pH is shown in **Figure 6** and the effect of varying salt type is shown in **Figure 7** for Anti-TSH in cell culture supernatant on ToyoScreen Phenyl-650M.

Figure 6: Effect of eluent pH on chromatogram (separation of cell culture supernatant (Anti-TSH))



Resin: TOYOPEARL Phenyl-650M
Column size: ToyoScreen, 1 mL
Mobile phase: Buffer A: 0.1 mol/L phosphate buffer + 1.8 mol/L ammonium sulfate, pH 7.0
 Buffer B: 0.1 mol/L phosphate buffer, pH 7.0
Gradient: 30 min linear gradient, 30 CV
Flow rate: 1 mL/min
Injection vol.: 200 μL
Samples: cell culture supernatant ($\times 4$ diluted) (antibody: Anti-TSH)

Figure 7: Comparison of chromatogram under differing salt conditions (separation of cell culture supernatant (Anti-TSH))



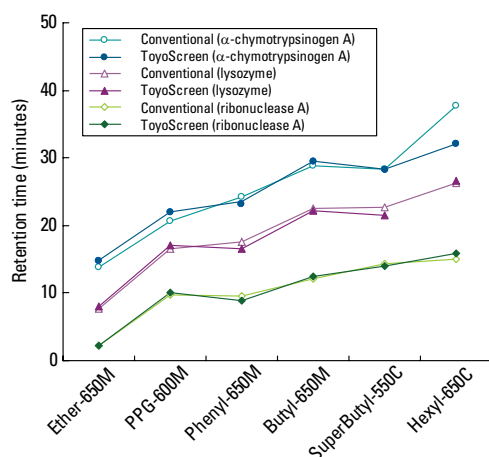
Resin: TOYOPEARL Phenyl-650M
Column size: ToyoScreen, 1 mL
Mobile phase: Buffer A: 0.1 mol/L phosphate buffer containing 1.8 mol/L each salt, pH 7.0
 Buffer B: 0.1 mol/L phosphate buffer, pH 7.0
Gradient: 30 min linear gradient, 30 CV
Flow rate: 1 mL/min
Injection vol.: 200 μL
Samples: cell culture supernatant ($\times 4$ diluted) (antibody: Anti-TSH)



Scalability

Initial results from resin screening and optimization with ToyoScreen columns accurately predict the separation behavior at larger scales. **Figure 8** illustrates the similar retention time behavior between 1 mL ToyoScreen columns and conventional 7.5 mm ID × 7.5 cm analytical columns. Additionally, **Figure 9** depicts a practical antibody scale-up in which conditions were set using a 1 mL ToyoScreen column and applied to a 10 mL semi-preparative column with a different inner diameter and length.

Figure 8: Comparison of selectivity between ToyoScreen and conventional column



Resins: TOYOPEARL Ether-650M
TOYOPEARL PPG-600M
TOYOPEARL Phenyl-650M
TOYOPEARL Butyl-650M
TOYOPEARL SuperButyl-550C
TOYOPEARL Hexyl-650C

Column size: ToyoScreen, 1 mL
Conventional column, 7.5 mm ID × 7.5 cm

Mobile phase: Buffer A: 0.1 mol/L phosphate buffer + 1.8 mol/L sodium sulfate, pH 7.0
Buffer B: 0.1 mol/L phosphate buffer, pH 7.0

Gradient: 30 min linear gradient, 30 CV

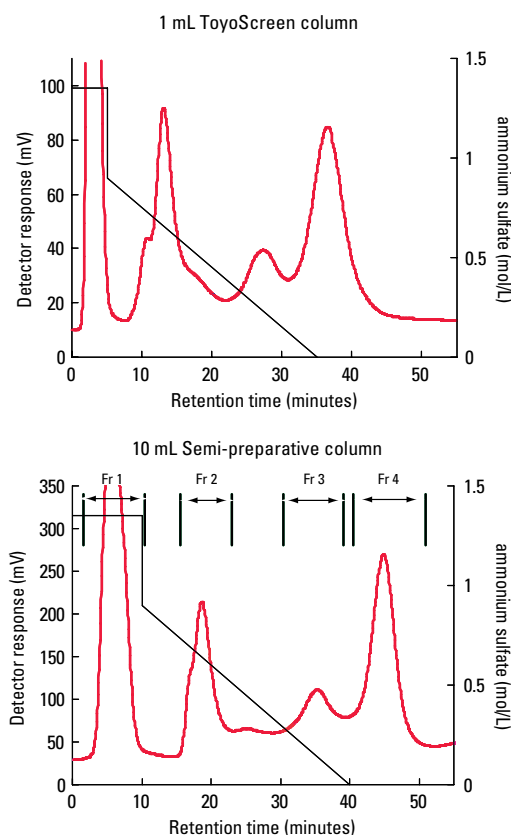
Flow rate: 1 mL/min

Injection vol.: 50 µL

Samples: ribonuclease A, lysozyme, α-chymotrypsinogen A
1 mg/mL

Retention time of conventional column was plotted after converting following equation: plotted value = actual measurement value - 4.82

Figure 9: Comparison chromatograms between ToyoScreen and semi-preparative columns



Resin: TOYOPEARL Phenyl-650M

Mobile phase: Buffer A: 0.1 mol/L phosphate buffer containing 1.8 mol/L (NH₄)₂SO₄, pH 7.0
Buffer B: 0.1 mol/L phosphate buffer, pH 7.0

Sample: anti-TSH from cell culture supernatant (× 4 diluted)

	1 mL ToyoScreen	10 mL semi-preparative
Column dimensions	6.4 mm ID × 3 cm	14.6 mm ID × 6 cm
Injection vol.	500 µL	5000 µL
Flow rate	0.5 mL/min; 0.5 CV/min; 93 cm/hr	2.5 mL/min; 0.25 CV/ min; 90 cm/hr
Gradient profile	25% B; 0-5 min (isocratic) 50% B: 5 min (step) 50% to 100% B; 5-35 min (linear)	25% B; 0-10 min (isocratic) 50% B: 10 min (step) 50% to 100% B; 10-40 min (linear)
Gradient slope*	0.06 mol/L/mL	0.012 mol/L/mL

* The gradient slope is the change in ionic strength per unit volume.
Gradient volume is the product of flow rate and gradient time.

Ordering Information - ToyoScreen process development columns

Please note that a ToyoScreen column holder is needed with each ToyoScreen column.

Part #	Description	Matrix	Container size
Ion Exchange			
23472	ToyoScreen Sulfate-650F, 1 mL	polymer	1 mL x 6 ea
23473	ToyoScreen Sulfate-650F, 5 mL	polymer	5 mL x 6 ea
23443	ToyoScreen NH ₂ -750F, 1 mL	polymer	1 mL x 6 ea
23444	ToyoScreen NH ₂ -750F, 5 mL	polymer	5 mL x 6 ea
21366	ToyoScreen CM-650M, 1 mL	polymer	1 mL x 6 ea
21367	ToyoScreen CM-650M, 5 mL	polymer	5 mL x 6 ea
21360	ToyoScreen DEAE-650M, 1 mL	polymer	1 mL x 6 ea
21361	ToyoScreen DEAE-650M, 5 mL	polymer	5 mL x 6 ea
22872	ToyoScreen GigaCap DEAE-650M, 1 mL	polymer	1 mL x 6 ea
22873	ToyoScreen GigaCap DEAE-650M, 5 mL	polymer	5 mL x 6 ea
21859	ToyoScreen GigaCap Q-650M, 1 mL	polymer	1 mL x 6 ea
21860	ToyoScreen GigaCap Q-650M, 5 mL	polymer	5 mL x 6 ea
21868	ToyoScreen GigaCap S-650M, 1 mL	polymer	1 mL x 6 ea
21869	ToyoScreen GigaCap S-650M, 5 mL	polymer	5 mL x 6 ea
21951	ToyoScreen GigaCap CM-650M, 1 mL	polymer	1 mL x 6 ea
21952	ToyoScreen GigaCap CM-650M, 5 mL	polymer	5 mL x 6 ea
21870	ToyoScreen MegaCap II SP-550EC, 1 mL	polymer	1 mL x 6 ea
21871	ToyoScreen MegaCap II SP-550EC, 5 mL	polymer	5 mL x 6 ea
21362	ToyoScreen SuperQ-650M, 1 mL	polymer	1 mL x 6 ea
21363	ToyoScreen SuperQ-650M, 5 mL	polymer	5 mL x 6 ea
21992	ToyoScreen Q-600C AR, 1 mL	polymer	1 mL x 6 ea
21993	ToyoScreen Q-600C AR, 5 mL	polymer	5 mL x 6 ea
21364	ToyoScreen QAE-550C, 1 mL	polymer	1 mL x 6 ea
21365	ToyoScreen QAE-550C, 5 mL	polymer	5 mL x 6 ea
21370	ToyoScreen SP-550C, 1 mL	polymer	1 mL x 6 ea
21371	ToyoScreen SP-550C, 5 mL	polymer	5 mL x 6 ea
21368	ToyoScreen SP-650M, 1 mL	polymer	1 mL x 6 ea
21369	ToyoScreen SP-650M, 5 mL	polymer	5 mL x 6 ea
Hydrophobic Interaction			
21494	ToyoScreen Butyl-600M, 1 mL	polymer	1 mL x 6 ea
21495	ToyoScreen Butyl-600M, 5 mL	polymer	5 mL x 6 ea
21376	ToyoScreen Butyl-650M, 1 mL	polymer	1 mL x 6 ea
21377	ToyoScreen Butyl-650M, 5 mL	polymer	5 mL x 6 ea
21372	ToyoScreen Ether-650M, 1 mL	polymer	1 mL x 6 ea
21373	ToyoScreen Ether-650M, 5 mL	polymer	5 mL x 6 ea
21378	ToyoScreen Hexyl-650C, 1 mL	polymer	1 mL x 6 ea
21379	ToyoScreen Hexyl-650C, 5 mL	polymer	5 mL x 6 ea
21892	ToyoScreen Phenyl-600M, 1 mL	polymer	1 mL x 6 ea
21893	ToyoScreen Phenyl-600M, 5 mL	polymer	5 mL x 6 ea
21374	ToyoScreen Phenyl-650M, 1 mL	polymer	1 mL x 6 ea
21375	ToyoScreen Phenyl-650M, 5 mL	polymer	5 mL x 6 ea
21380	ToyoScreen PPG-600M, 1 mL	polymer	1 mL x 6 ea
21381	ToyoScreen PPG-600M, 5 mL	polymer	5 mL x 6 ea

Part #	Description	Matrix	Container size
21382	ToyoScreen SuperButyl-550C, 1 mL	polymer	1 mL x 6 ea
21383	ToyoScreen SuperButyl-550C, 5 mL	polymer	5 mL x 6 ea
Mixed-Mode			
22824	ToyoScreen MX-Trp-650M, 1 mL	polymer	1 mL x 6 ea
22825	ToyoScreen MX-Trp-650M, 5 mL	polymer	5 mL x 6 ea
Affinity			
21384	ToyoScreen AF-Chelate-650M, 1 mL	polymer	1 mL x 6 ea
21385	ToyoScreen AF-Chelate-650M, 5 mL	polymer	5 mL x 6 ea
21390	ToyoScreen AF-Heparin HC-650M, 1 mL	polymer	1 mL x 6 ea
21391	ToyoScreen AF-Heparin HC-650M, 5 mL	polymer	5 mL x 6 ea
21388	ToyoScreen AF-Red-650M, 1 mL	polymer	1 mL x 6 ea
21389	ToyoScreen AF-Red-650M, 5 mL	polymer	5 mL x 6 ea
Protein A			
22809	ToyoScreen AF-rProtein A-650F, 1 mL	polymer	1 mL x 5 ea
22810	ToyoScreen AF-rProtein A-650F, 5 mL	polymer	5 mL x 1 ea
22811	ToyoScreen AF-rProtein A-650F, 5 mL	polymer	5 mL x 5 ea
23430	ToyoScreen AF-rProtein A HC-650F, 1 mL	polymer	1 mL x 5 ea
23431	ToyoScreen AF-rProtein A HC-650F, 5 mL	polymer	5 mL x 1 ea
23432	ToyoScreen AF-rProtein A HC-650F, 5 mL	polymer	5 mL x 5 ea
Protein L			
23494	ToyoScreen AF-rProtein L-650F, 1 mL	polymer	1 mL x 5 ea
23495	ToyoScreen AF-rProtein L-650F, 5 mL	polymer	5 mL x 1 ea
23496	ToyoScreen AF-rProtein L-650F, 5 mL	polymer	5 mL x 5 ea
Anion Mix Pack (DEAE-650M, SuperQ-650M, QAE-550C, GigaCap Q-650M, Q-600C AR)			
21392	ToyoScreen IEC Anion Mix Pack, 1 mL	polymer	1 mL x 5 grades x 1 each
21393	ToyoScreen IEC Anion Mix Pack, 1 mL	polymer	5 mL x 5 grades x 1 each
Cation Mix Pack (CM-650M, SP-650M, SP-550C, GigaCap CM-650M, GigaCap S-650M)			
21394	ToyoScreen IEC Cation Mix Pack, 1 mL	polymer	1 mL x 5 grades x 1 each
21395	ToyoScreen IEC Cation Mix Pack, 5 mL	polymer	5 mL x 5 grades x 1 each
IEX Mix Pack (GigaCap Q-650M, SuperQ-650M, Q-600C AR, GigaCap CM-650M, GigaCap S650M, SP-550C)			
21396	ToyoScreen IEC Mix Pack, 1 mL	polymer	1 mL x 5 grades x 1 each
21397	ToyoScreen IEC Mix Pack, 5 mL	polymer	5 mL x 5 grades x 1 each
HIC Mix Pack (PPG-600M, Phenyl-600M, Phenyl-650M, Butyl-600M, Butyl-650M, Hexyl-650C)			
21398	ToyoScreen HIC Mix Pack, 1 mL	polymer	1 mL x 5 grades x 1 each
21399	ToyoScreen HIC Mix Pack, 5 mL	polymer	5 mL x 5 grades x 1 each
ToyoScreen Accessories			
21400	ToyoScreen Column Holder		
42194	ToyoScreen Holder with fittings		Incl. 1 x 21400, 2 x 42196, 1 x 42195
42195	Column Coupler, 10-32, 0.03"ID SS Tubing		
42196	Adapter, M6 interior to 10-32 exterior, PEEK		
42197	Adapter, 1/4-28 interior to 10-32 exterior, PEEK		

ToyoScreen RoboColumns

ToyoScreen RoboColumns are miniaturized chromatographic columns pre-packed with TOYOPEARL ion exchange, mixed-mode, hydrophobic interaction or affinity media. They are packed with TOYOPEARL to our specifications by Atoll GmbH and are supplied in strips of 8 columns. Available in different volumes, ToyoScreen RoboColumns are designed to operate with a robotic liquid handling system, such as the Freedom EVO® from TECAN.

This approach allows automated high throughput, small-scale biochromatographic separations of protein samples by running up to eight individual columns simultaneously. Liquid flow in the columns is driven by positive pressure liquid displacement, rather than by air pressure, thus mimicking the situation in columns individually connected to a conventional standalone chromatography system.

ToyoScreen RoboColumns can be used in a wide range of applications, including individual and parallel resin screening, optimization of separation conditions, scale-down experiments, as well as high throughput sample preparation.

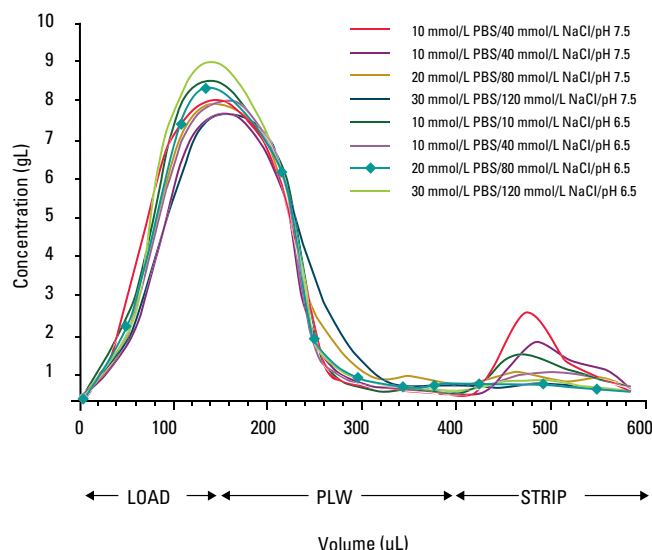
Resin Screening with ToyoScreen RoboColumns

Binding and elution conditions, washing parameters, etc. can be investigated to explore the design space of the particular molecule's purification process. Design of Experiments (DoE), a statistical approach used to define those factors having the greatest impact on the process, is a suitable tool to minimize the number of experiments needed.

Figure 10 shows a screening experiment to optimize the chromatographic parameters for the intermediate flow through anion exchange step in a purification platform for monoclonal antibodies (mAbs). Protein binding of a protein A capture eluate on ToyoScreen RoboColumns packed with TOYOPEARL SuperQ-650M resin was analyzed by varying salt concentration and pH of loading and washing buffer. Best results were achieved using 20 mmol/L sodium phosphate, 80 mmol/L sodium chloride, pH 6.5.



Figure 10: Optimization of anion exchange conditions



Elution profile of a protein A capture eluate on ToyoScreen RoboColumns packed with TOYOPEARL SuperQ-650M at various conditions. Data kindly provided by T. Schröder, Atoll GmbH.

Separation with ToyoScreen RoboColumns

ToyoScreen RoboColumns can be used to perform small scale purifications/separations by applying either an isocratic or step gradient. Examples are small scale mAb purification using protein A affinity for in-process monitoring of fermentation or sample preparation prior to subsequent analysis by MS, ELISA or CGE/SDS-Page.

Formats of ToyoScreen RoboColumns

ToyoScreen RoboColumns are available in two formats with 200 μL (bed height of 10 mm) and 600 μL (bed height of 30 mm) resin volume, respectively. They are supplied in a row of eight units pre-packed with the same TOYOPEARL resin and sealed with two removable silicon cover seals for proper storage.

They can be individually arranged on a 96 position array plate. All chromatographic media used in the ToyoScreen RoboColumns are also available in larger pre-packed ToyoScreen columns of 1 mL or 5 mL volume and as bulk resins for use at all scales.

Ordering Information - ToyoScreen RoboColumns

Part #	Packed with:	Package Description
Ion Exchange		
45027	TOYOPEARL Sulfate-650F	8 × 200 µL
45028	TOYOPEARL Sulfate-650F	8 × 600 µL
45021	TOYOPEARL NH ₂ -750F	8 × 200 µL
45022	TOYOPEARL NH ₂ -750F	8 × 600 µL
45023	TOYOPEARL GigaCap S-650S	8 × 200 µL
45024	TOYOPEARL GigaCap S-650S	8 × 600 µL
45001	TOYOPEARL GigaCap S-650M	8 × 200 µL
45002	TOYOPEARL GigaCap S-650M	8 × 600 µL
45025	TOYOPEARL GigaCap Q-650S	8 × 200 µL
45026	TOYOPEARL GigaCap Q-650S	8 × 600 µL
45003	TOYOPEARL GigaCap Q-650M	8 × 200 µL
45004	TOYOPEARL GigaCap Q-650M	8 × 600 µL
45005	TOYOPEARL GigaCap CM-650M	8 × 200 µL
45006	TOYOPEARL GigaCap CM-650M	8 × 600 µL
45007	TOYOPEARL GigaCap DEAE-650M	8 × 200 µL
45008	TOYOPEARL GigaCap DEAE-650M	8 × 600 µL
45011	TOYOPEARL Q-600C AR	8 × 200 µL
45012	TOYOPEARL Q-600C AR	8 × 600 µL
45013	TOYOPEARL SuperQ-650M	8 × 200 µL
45014	TOYOPEARL SuperQ-650M	8 × 600 µL
Hydrophobic Interaction		
45031	TOYOPEARL Phenyl-600M	8 × 200 µL
45032	TOYOPEARL Phenyl-600M	8 × 600 µL
45033	TOYOPEARL Butyl-600M	8 × 200 µL
45034	TOYOPEARL Butyl-600M	8 × 600 µL
45089	TOYOPEARL Butyl-650M	8 × 200 µL
45090	TOYOPEARL Butyl-650M	8 × 600 µL
45035	TOYOPEARL PPG-600M	8 × 200 µL
45036	TOYOPEARL PPG-600M	8 × 600 µL
45037	TOYOPEARL Phenyl-650M	8 × 200 µL
45038	TOYOPEARL Phenyl-650M	8 × 600 µL
45091	TOYOPEARL Hexyl-650C	8 × 200 µL
45092	TOYOPEARL Hexyl-650C	8 × 600 µL
Mixed-Mode		
45051	TOYOPEARL MX-Trp-650M	8 × 200 µL
45052	TOYOPEARL MX-Trp-650M	8 × 600 µL
Protein A		
45061	TOYOPEARL AF-rProtein A-650F	8 × 200 µL
45062	TOYOPEARL AF-rProtein A-650F	8 × 600 µL
45063	TOYOPEARL AF-rProtein A HC-650F	8 × 200 µL
45064	TOYOPEARL AF-rProtein A HC-650F	8 × 600 µL
Protein L		
45065	TOYOPEARL AF-rProtein L-650F	8 × 200 µL
45066	TOYOPEARL AF-rProtein L-650F	8 × 600 µL

Size Exclusion		
45071	TOYOPEARL HW-40F	8 × 200 µL
45072	TOYOPEARL HW-40F	8 × 600 µL
Accessories		
45099	Array plate	

TOYOPEARL and TSKgel LabPak Media

LabPak products are multi-milliliter containers of TOYOPEARL and TSKgel bulk media products. Typically they contain 3 or 4 different ligand types offered for a particular chromatography mode.

They are useful for developmental engineers who wish to familiarize themselves with resin physical properties in different buffer systems:

- slurry and reslurry mechanics
- resin handling during column packing
- mechanical strength relative to agarose
- degree of compressibility
- flow adaptor regimen

The larger resin amounts in LabPak products allow the packing of wider ID and longer columns than available in the ToyoScreen products. This helps the developmental chemist or engineer to better measure under actual packing conditions the following properties:

- dynamic binding capacity
- selectivity
- column efficiency

Ordering Information - TOYOPEARL LabPak media

Part #	Description	Package Description
Size Exclusion		
19820	SECPAK HP (HW-40, 50, 55, 65S), 30 µm	4 × 150 mL
19821	SECPAK LMW (HW-40, 50, 55F), 45 µm	3 × 150 mL
19819	SECPAK HMW (HW-55, 65, 75F), 45 µm	3 × 150 mL
Ion Exchange		
19817	IEXPAK HP (DEAE-650S, SP-650S, CM-650S, SuperQ-650S), 35 µm	4 × 25 mL
43210	AIEXPAK (GigaCap Q-650M, SuperQ-650M, Q-600C AR), 65/75/100 µm	3 × 25 mL
43220	CIEXPAK (GigaCap CM-650M, GigaCap S-650M, SP-550C), 75/100 µm	3 × 25 mL
Hydrophobic Interaction		
43150	HICPAK HP (Ether, Phenyl, Butyl-650S), 35 µm	3 × 25 mL
19806	HICPAK (Ether, Phenyl, Butyl-650M), 65 µm	3 × 25 mL
43125	HICPAK-C (Phenyl, Butyl, Hexyl-650C), 100 µm	3 × 25 mL
Affinity		
43400	AFFIPAK ACT (AF-Epoxy, Tresyl-650M), 65 µm	2 × 5 g*
43410	AFFIPAK (AF-Amino, Carboxyl, Formyl-650 M), 65 µm	3 × 10 mL

*1 g is approximately 3.5 mL

Ordering Information - TSKgel LabPak media

Part #	Description	Package Description
Ion Exchange		
43380	IEXPAK PW (DEAE-5PW, SP-5PW, SuperQ-5PW), 20 µm	3 × 25 mL
43280	IEXPAK PW (DEAE-5PW, SP-5PW, SuperQ-5PW), 30 µm	3 × 25 mL
Hydrophobic Interaction		
43278	HICPAK PW (Ether-5PW, Phenyl-5PW), 20 µm	2 × 25 mL
43175	HICPAK PW (Ether-5PW, Phenyl-5PW), 30 µm	2 × 25 mL

Resin Seeker 96-Well Plate Kits

Resin Seeker 96-well plates are disposable filter plates packed with TOYOPEARL and Ca⁺⁺Pure-HA resins and are available in several configurations for ion exchange, HIC, mixed-mode, hydroxyapatite, and protein A chromatography. Resin Seeker 96-well plates can be used to screen multiple steps of the purification process including binding, wash, and elution conditions in addition to resin selectivity, binding kinetics, purity, and recovery of your target molecule.

Resin Seeker 96-well plate kits are manufactured by Orochem and sold by Tosoh Bioscience. All components necessary to run an experiment are included in each kit: a wash plate and collection plate. Resin Seeker plates can be operated manually using a multi-channel pipette or in an automated system designed for high throughput screening in a 96-well plate format.

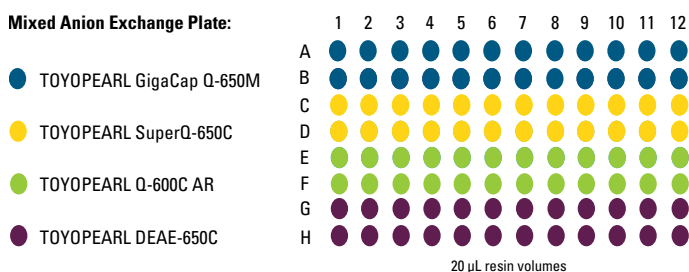
TOYOPEARL resins used in the Resin Seeker 96-well plates are also available in ToyoScreen pre-packed columns and as bulk media. This allows seamless scale-up and process optimization once resin screening is complete.

Ordering Information - Resin Seeker 96-well plate kits

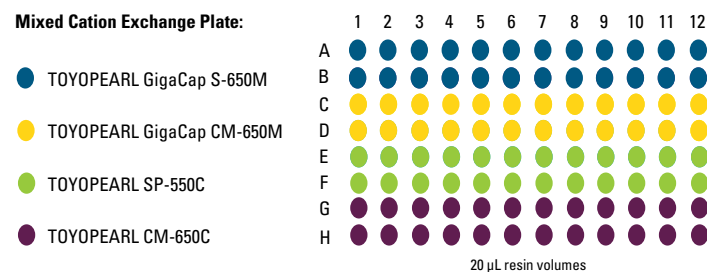
Part #	Description	Package Description
OC41MDAEX-96	ALEX kit	Mixed anion exchange plate (20 µL resin beds)
OC41MDGCDE-650M	GigaCap DEAE-650M kit	TOYOPEARL GigaCap DEAE-650M plate (20 µL resin beds)
OC41MDGCQ-650M	GigaCap Q-650M kit	TOYOPEARL GigaCap Q-650M plate (20 µL resin beds)
OC41MDCEX-96	CLEX kit	Mixed cation exchange plate (20 µL resin beds)
OC41MDGCCM-650M	GigaCap CM-650M kit	TOYOPEARL GigaCap CM-650M plate (20 µL resin beds)
OC41MDGCS-650M	GigaCap S-650M kit	TOYOPEARL GigaCap S-650M plate (20 µL resin beds)
OC41MDHIC-96	HIC kit	Mixed hydrophobic interaction plate (20 µL resin beds)
OC41MDTRP-96	MMC kit	TOYOPEARL MX-Trp-650M plate (20 µL resin beds)
OC41MDAFPA-650F	Protein A HC kit	TOYOPEARL AF-rProtein A HC-650F plate (20 µL resin beds)
OC41MDAFPL-650F	Protein L kit	TOYOPEARL AF-rProtein L-650F plate (20 µL resin beds)
OC41MDNH2-750F	NH ₂ -750F kit	TOYOPEARL NH ₂ -750F plate (20 µL resin beds)
OC41MDCPHA	Ca ⁺⁺ Pure-HA kit	Ca ⁺⁺ Pure-HA plate (20 µL resin beds)
OC41MDCPHA-500	Ca ⁺⁺ Pure-HA kit	Ca ⁺⁺ Pure-HA plate (500 µL resin beds)
OC41MDLSFT-650F	Sulfate-650F kit	TOYOPEARL Sulfate-650F plate (20 µL resin beds)

Plate configurations available for Resin Seeker mixed plate offerings:

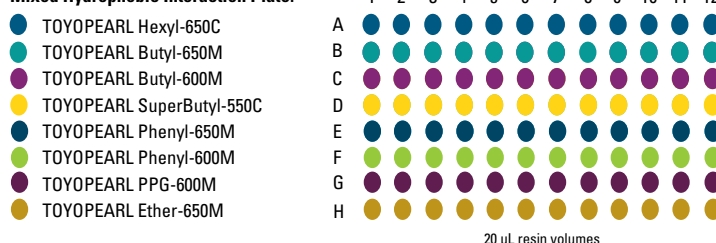
Mixed Anion Exchange Plate:



Mixed Cation Exchange Plate:



Mixed Hydrophobic Interaction Plate:



MiniChrom Columns

MiniChrom columns are small, pre-packed columns (8 mm ID x 10 cm) with 5 mL resin volume designed for fast method development or resin screening with TOYOPEARL, TSKgel and Ca⁺⁺Pure-HA resins. They guarantee optimal performance and can be connected to common high or medium pressure liquid chromatography systems.

The 5 mL MiniChrom columns are the ideal tool to further optimize a purification method and/or to confirm operational parameters after having selected a resin for a certain

purification task by resin screening, e.g. with ToyoScreen cartridges on conventional LC systems or by high throughput screening using RoboColumns on robotic workstations. Two columns can be connected in series to increase the column height in order to model real conditions in pilot scale or for scale down experiments.

MiniChrom columns are packed by Atoll GmbH. They are reproducibly and individually flow-packed to account for the varying compressibility of each resin. Therefore, each column provides an accurate representation of resin performance that translates to full scale production columns.

Ordering Information - MiniChrom columns

Part #	Description	Column Dimensions
45101	TOYOPEARL GigaCap S-650M, 75 µm	8 mm ID x 10 cm
45102	TOYOPEARL GigaCap S-650S, 35 µm	8 mm ID x 10 cm
45103	TOYOPEARL GigaCap CM-650M, 75 µm	8 mm ID x 10 cm
45104	TOYOPEARL GigaCap Q-650M, 75 µm	8 mm ID x 10 cm
45105	TOYOPEARL GigaCap Q-650S, 35 µm	8 mm ID x 10 cm
45106	TOYOPEARL GigaCap DEAE-650M, 75 µm	8 mm ID x 10 cm
45107	TSKgel SuperQ-5PW (20), 20 µm	8 mm ID x 10 cm
45108	TOYOPEARL NH ₂ -750F, 45 µm	8 mm ID x 10 cm
45109	TOYOPEARL SuperQ-650M, 65 µm	8 mm ID x 10 cm
45110	TOYOPEARL SP-650M, 65 µm	8 mm ID x 10 cm
45111	TOYOPEARL SP-650S, 35 µm	8 mm ID x 10 cm
45112	TOYOPEARL DEAE-650M, 65 µm	8 mm ID x 10 cm
45113	TOYOPEARL DEAE-650S, 35 µm	8 mm ID x 10 cm
45114	TOYOPEARL SuperQ-650S, 35 µm	8 mm ID x 10 cm
45115	TOYOPEARL Q-600C AR, 100 µm	8 mm ID x 10 cm
45116	TSKgel SP-5PW, 20 µm	8 mm ID x 10 cm
45117	TOYOPEARL Sulfate-650F, 45 µm	8 mm ID x 10 cm
45119	TOYOPEARL QAE-550C, 100 µm	8 mm ID x 10 cm
45121	TOYOPEARL Phenyl-650M, 65 µm	8 mm ID x 10 cm
45122	TOYOPEARL Phenyl-650S, 35 µm	8 mm ID x 10 cm
45123	TOYOPEARL Phenyl-600M, 65 µm	8 mm ID x 10 cm
45124	TOYOPEARL PPG-600M, 65 µm	8 mm ID x 10 cm
45125	TOYOPEARL Butyl-650M, 65 µm	8 mm ID x 10 cm
45126	TOYOPEARL Butyl-650S, 35 µm	8 mm ID x 10 cm
45127	TOYOPEARL Butyl-600M, 65 µm	8 mm ID x 10 cm
45128	TOYOPEARL SuperButyl-550C, 100 µm	8 mm ID x 10 cm
45129	TOYOPEARL Hexyl-650C, 100 µm	8 mm ID x 10 cm
45130	TSKgel Phenyl-5PW (20), 20 µm	8 mm ID x 10 cm
45151	TOYOPEARL MX-Trp-650M, 75 µm	8 mm ID x 10 cm
45152	Ca ⁺⁺ Pure-HA, 39 µm	8 mm ID x 10 cm
45161	TOYOPEARL AF-rProtein A HC-650F, 45 µm	8 mm ID x 10 cm
45162	TOYOPEARL AF-rProtein L-650F, 45 µm	8 mm ID x 10 cm
45171	TOYOPEARL HW-40F, 45 µm	8 mm ID x 10 cm

Part #	Description	Column Dimensions
45181	TOYOPEARL CM-650M, 65 µm	8 mm ID × 10 cm
45182	TOYOPEARL CM-650S, 35 µm	8 mm ID × 10 cm
45183	TSKgel SP-3PW, 30 µm	8 mm ID × 10 cm
45184	TSKgel DEAE-5PW, 20 µm	8 mm ID × 10 cm
45185	TOYOPEARL SP-550C, 100 µm	8 mm ID × 10 cm
45186	TOYOPEARL MegaCap II SP-550EC, >100 µm	8 mm ID × 10 cm

About: TOYOPEARL Protein A ELISA Kit

An ELISA (enzyme-linked immunosorbent assay) kit is available for TOYOPEARL AF-rProtein A-650F and TOYOPEARL AF-rProtein A HC-650F resins from Cygnus Technologies. The TOYOPEARL ELISA kit is used for the quantitation of leached protein A ligand present in eluted product.

Please note that this kit is specifically prepared for TOYOPEARL AF-rProtein A-650F and TOYOPEARL AF-rProtein A HC-650F resins respectively. Test kits for other commercially available protein A products may not work properly for these TOYOPEARL protein A resins.

Ordering Information - TOYOPEARL protein A ELISA kit

Part #	Description
F910	Tosoh R40 and R28 Protein A, Mix-N-Go ELISA Kit

Please contact Cygnus Technologies directly for pricing and to order:

Phone: 910-454-9442

Email: orders@cygnustechnologies.com

About: TOYOPEARL Protein L ELISA Kit

The following ELISA (enzyme-linked immunosorbent assay) kit is available for TOYOPEARL AF-rProtein L-650F resin.

The TOYOPEARL ELISA kit is used for the quantitation of leached protein L ligand present in eluted product.

Ordering Information - TOYOPEARL protein L ELISA kit

Part #	Description
23497	ELISA Kit for Protein L-T36