

Toyopearl GigaCap® S-650M

TOYOPEARL
APPLICATION NOTE

A very high capacity cation exchange resin

Toyopearl GigaCap® S-650M, a new, very high capacity cation exchange resin* for process scale applications was developed by the researchers at Tosoh Corporation. This resin, with dynamic binding capacities approaching 145mg/mL for IgG molecules, is the newest member of the TOYOPEARL® product line.

Introduction

Recent advances in the ability of upstream processes to manufacture biotherapeutic proteins at levels up to 10mg/mL in the cell culture fluid have placed increasing demands on downstream unit operations. One of the potential bottlenecks in the downstream processes is the binding capacity of the chromatographic resin. If more capacity can be engineered into the resin, smaller columns, improved throughput and less buffer consumption can be utilized. Tosoh Corporation designed a new cation exchange resin that has very high binding capacity for the purification of biotherapeutic molecules to alleviate this potential bottleneck. This new resin, Toyopearl GigaCap S-650M, has a dynamic binding capacity close to 145mg/mL for IgG and is designed to have a long lifetime, withstand high flow rates and tolerate aggressive cleaning regimens.

Experimental Conditions

Toyopearl HW-65 size exclusion resin was functionalized with sulfonic acid groups using a proprietary spacer group to generate Toyopearl GigaCap S-650M. To determine the dynamic binding capacity, 6.0mm ID x 4.0cm columns were packed with the new resin. Polyclonal human IgG (1mg/mL) in 0.1mol/L acetate buffer (pH 4.7) was loaded onto the column at various flow rates (Figure 1). The dynamic binding capacity was measured at 10% breakthrough (absorbance at 280nm). Additionally, a smaller molecule (i.e. lysozyme) was also tested and the dynamic binding capacity was measured (Table 1).

Results

At extremely fast processing flow rates of greater than 1000cm/h the new cation exchange resin demonstrated an impressive 75mg/mL IgG binding capacity. As the flow rate was decreased to a more traditional 200cm/h the resin exhibited an enormous 145mg/mL binding capacity. Under the conditions described in this note, the new Toyopearl GigaCap S-650M resin featured very high binding capacities with excellent binding kinetics (Figure 1) and almost quantitative recoveries (data not shown). The physical properties of Toyopearl GigaCap S-650M compared to the existing Toyopearl SP products are listed in Table 1.

*Specifically designed for packed bed use.

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Figure 1. IgG Breakthrough Curves at Various Flow Rates

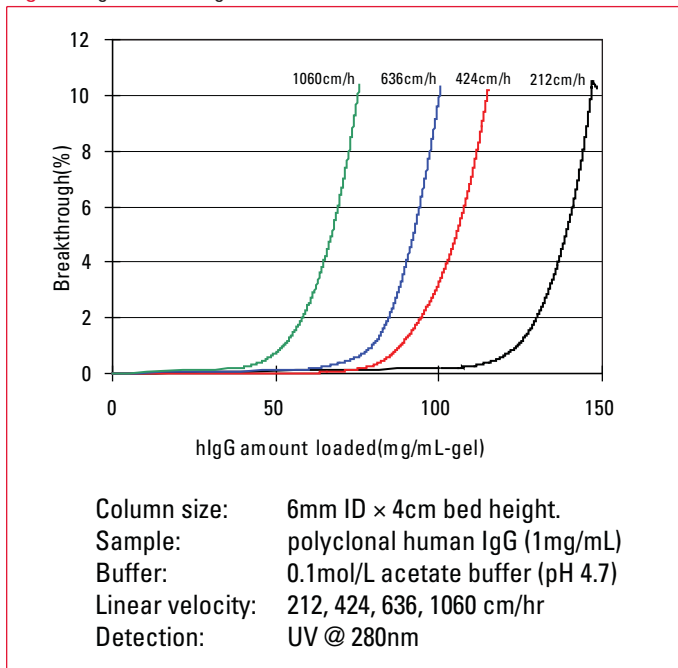


Table 1. Typical Properties of Toyopearl GigaCap S-650M

	Toyopearl SP-650M	Toyopearl SP-550C	Toyopearl GigaCap S-650M
Particle size (µm)	40 - 90	50 - 150	50 - 100
Ion exchange capacity (meq/mL resin)	0.13 - 0.17	0.14 - 0.18	0.1 - 0.2
Binding capacity (mg/mL -gel)			
lysozyme @ 212cm/hr	48	81	167 (280cm/hr)
IgG @ 212cm/hr	43	14	145

Conclusions

Toyopearl GigaCap S-650M is an ideal cation exchange resin for the chromatographic purification of biotherapeutic products. Both large and small molecules had increased binding capacities making it a versatile resin for all proteins. With the high binding capacities, the need for very large columns and massive buffer consumption are minimized particularly for those proteins expressed at higher levels as a result of upstream improvements. The new Toyopearl GigaCap S-650M chromatography resin is based on the same base bead as the other Toyopearl resins and, therefore, will have similar pressure-flow and chemical stability characteristics.



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Ordering Information

Part #	Description	Resin Volume
21833	Toyopearl GigaCap S-650M	100mL
21834	Toyopearl GigaCap S-650M	250mL
21835	Toyopearl GigaCap S-650M	1L
21836	Toyopearl GigaCap S-650M	5L
21837	Toyopearl GigaCap S-650M	50L
21868	ToyoScreen GigaCap S-650M	1mL X 6 ea.
21869	ToyoScreen GigaCap S-650M	5mL X 6 ea.



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