

Prepacked OptioBio columns for small-scale purifications and process development

Kajsa Eriksson, Anna Heijbel and Lars Haneskog
Bio-Works, Uppsala, Sweden

Introduction

The prepacked OptioBio™ glass columns are designed for small-scale purification as well as screening and optimization in bioprocess development and scale-up. These columns have a column volume of 7.9 ml with 10-mm i.d. and 100-mm bed height (Fig 1).

OptioBio 40S 10x100 and OptioBio 40Q 10x100 columns are prepacked with WorkBeads™ 40S and WorkBeads 40Q resins for ion exchange chromatography (IEX). The resins are designed for research and industrial scale purification of proteins, peptides and nucleic acids, and utilise the difference in these molecules surface charge.

WorkBeads 40S is a strong cation exchange resin with sulfonate ligands, and WorkBeads 40Q a strong anion exchange resin with quaternary amine ligands (Fig 2).

The resins allow high-resolution separation in combination with low backpressure which make them excellent for both capture and polishing purification applications.

Resolution

The resolution of the prepacked OptioBio columns were compared with the HiScreen IEX columns from GE Healthcare (Fig 4 and Fig 5). A protein mixture was separated under the same conditions for the comparable columns, and with the same sample load per ml resin and linear flow rate.

Sample: 1.5 mg/ml concanavalin A, 0.5 mg/ml α-chymotrypsinogen A, 1.5 mg/ml ribonuclease A, 0.5 mg/ml lysozyme in binding buffer
Sample volume: 2.5 ml (OptioBio 40S 10x100) 1.5 ml (HiScreen Cpto SP ImpRes)
Binding buffer: 50 mM MES, pH 6.0
Elution buffer: 50 mM MES, 1 M NaCl, pH 6.0
Linear gradient: 0 - 50% in 20 column volumes (CV)
Flow rate: 150 cm/h, 4 minutes residence time 2.0 ml/min (OptioBio 40S 10x100) 1.2 ml/min (HiScreen Cpto SP ImpRes)

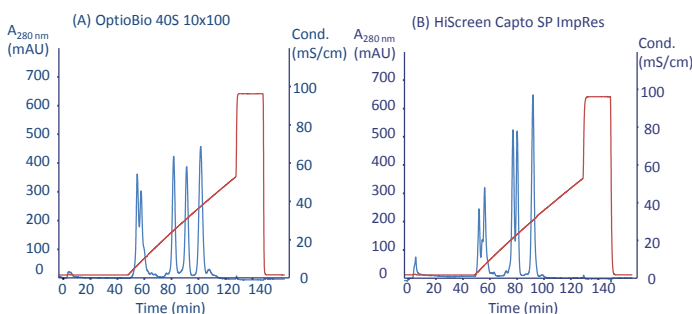


Figure 4. Resolution comparison on OptioBio 40S 10x100 (A) vs. HiScreen Cpto SP ImpRes (B).

Sample: 0.7 mg/ml apo-transferrin, 0.45 mg/ml α-lactalbumin, 1.4 mg/ml soybean trypsin inhibitor in binding buffer
Sample volume: 10 ml (OptioBio 40Q 10x100) 6 ml (HiScreen Cpto Q ImpRes)
Binding buffer: 50 mM Tris-HCl, pH 7.4
Elution buffer: 50 mM Tris-HCl, 1 M NaCl, pH 7.4
Linear gradient: 0 - 40% in 20 CV
Flow rate: 150 cm/h, 4 minutes residence time 2.0 ml/min (OptioBio 40Q 10x100) 1.2 ml/min (HiScreen Cpto Q ImpRes)

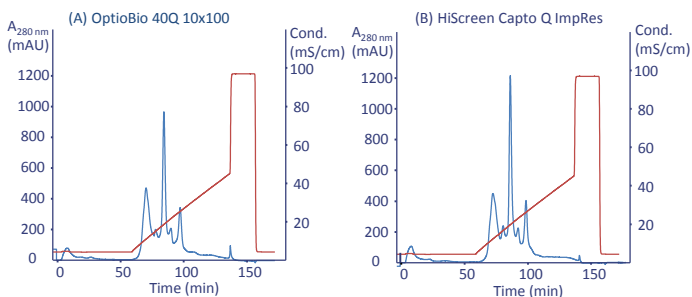


Figure 5. Resolution comparison on OptioBio 40Q 10x100 (A) vs. HiScreen Cpto Q ImpRes (B).

Conclusions

OptioBio 40S 10x100 and OptioBio 40Q 10x100 prepacked columns gave more than 30% higher dynamic binding capacity compared with HiScreen Cpto SP and HiScreen Cpto Q ImpRes, respectively.

OptioBio 40S 10x100 showed significantly higher selectivity and improved resolution for several of the proteins compared to HiScreen Cpto SP ImpRes. OptioBio 40Q 10x100 showed equal resolution as HiScreen Cpto Q ImpRes.



Figure 1. OptioBio 40S 10x100 and OptioBio 40Q 10x100 prepacked columns.

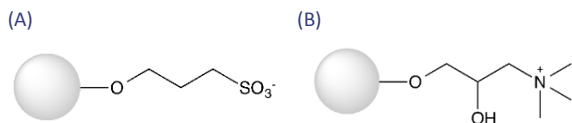


Figure 2. Structure of the ligand used in WorkBeads 40S (A) and WorkBeads 40Q (B).

Dynamic binding capacity (DBC)

The DBC using bovine serum albumin (BSA) of the prepacked OptioBio columns were compared with the HiScreen™ IEX columns from GE Healthcare (Fig 3). The same conditions were applied for comparable columns.

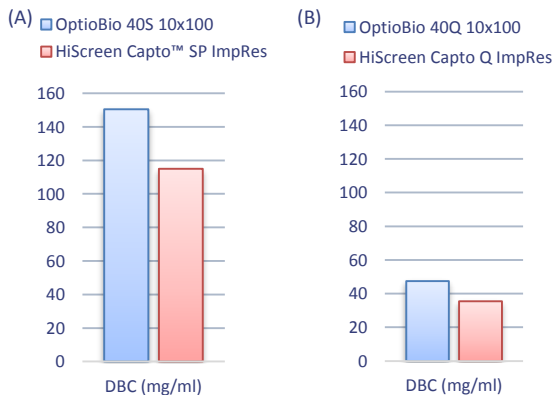


Figure 3. Comparison of dynamic binding capacity. DBC measured at 10% breakthrough (QB_{10%}). (A) 2 mg BSA/ml in 20 mM Na-citrate, pH 4.0. Flow rate 150 cm/h. (B) 1 mg BSA/ml in 50 mM Tris-HCl, 50 mM NaCl, pH 8.0. Flow rate 150 cm/h.

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