Application Note

Scale up with Sartobind® STIC PA pico

Miniaturized scaleable format for process developers

Introduction

Sartobind STIC capsules with 4 mm bed height are disposable membrane chromatography devices for polishing of biomolecules in biotechnological production processes.
Sartobind pico (0.08 ml bed volume) is the smallest scalable format in the Sartobind family. The pico has the same 4 mm bed height as the manufacturing scale capsules and scalability was tested through the following parameters:
– Protein binding
– Impurity removal (DNA, endotoxin, host cell protein, bacteriophages)
– Flow rate

The entire Sartobind STIC PA capsule family is listed in the following Table.

Membrane volume (MV) and void volume of Sartobind STIC 4 mm capsules

Sartobind STIC PA 4 mm	Membrane volume (ml)	Nominal void volume (ml)	Nominal void volume
pico	0.08	0.4	5
nano	1	5	5
5"	70	320	4.6
10"	180	800	4.4
30"	540	2500	4.6
mega	1620	9000	5.6

Summary

The aim of this study was to examine whether the Sartobind STIC PA pico meets the requirements. All runs were performed with the same membrane lot. The results show that all application requirements are met.

Results

Before testing binding capacities, devices were sanitized with 1 M NaOH for 30 min at 10 MV/min. Basic buffer was 150 mM NaCl 20 mM Tris/HCl pH 7.3 (+/– 0.1). After sanitization pH value was checked. The flow rate for all process steps was 10 MV/min.
Lot: Pico 201102D, Nano 119803163, 10" 119803263

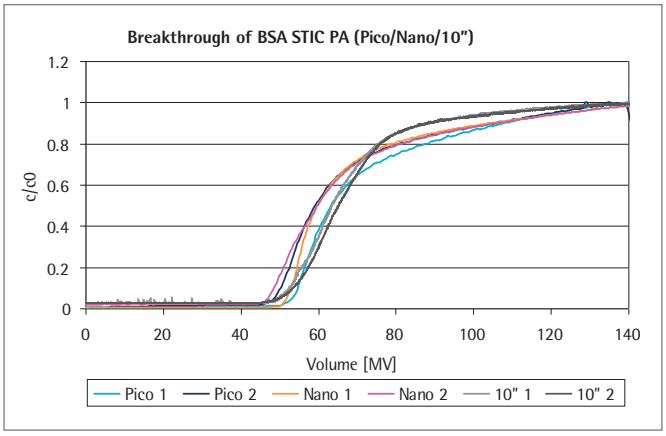
1. Binding of bovine serum albumin (BSA)

Method
– 100 MV Equilibration
– 150 MV Load with BSA in buffer (1 mg/mL)
– 100 MV Wash
– 100 MV Elution with 1 M NaCl in buffer

Dynamic binding capacity at 10% breakthrough:

Device	[mg/cm²]	Average [mg/cm²]	Average [mg/ml]
Pico 1	1.53		
Pico 2	1.40		
Pico 3	1.40		
Pico 4	1.33	1.41	51.3
Nano 1	1.47		
Nano 2	1.35	1.41	51.3
10"	1.42		
10"	1.45	1.44	52.4

Breakthrough curves:



Comparable performance with larger devices

2. Binding of DNA

Method
– 100 MV Equilibration
– 150 MV Load with Salmon Sperm DNA in buffer (0.1 mg/mL)

Dynamic binding capacity at 10% breakthrough:

Device	[mg/cm²]	Average [mg/cm²]	Average [mg/ml]
Pico 1	0.25		
Pico 2	0.26		
Pico 3	0.25		
Pico 4	0.25	0.25	9.1
Nano 1	0.22		
Nano 2	0.24	0.23	8.4

3. Endotoxin removal

Method
Endotoxin: LONZA LPS E.coli
Lysate chromogenic: Charles river endosafe Endochrome-K
ß-Glucan blocker: LONZA

– Additional cleaning procedure with NaOH to destroy present endotoxin in the system
– 200 MV Water
– 300 MV Equilibration
– 150 MV Load with Endotoxin in buffer (109 EU/mL)
– Sampling after 50, 100 and 150 MV

Determination of the Log Reduction Value:

Volume [MV]	Pico 1	Pico 2	Pico 3	Pico 4	Nano 1	Nano 2
50	> 3.96	> 3.96	2.92	> 3.96	> 3.96	> 3.96
100	> 3.96	> 3.96	> 3.96	> 3.96	> 3.96	> 3.96
150	> 3.96	> 3.96	> 3.96	> 3.96	> 3.96	> 3.96

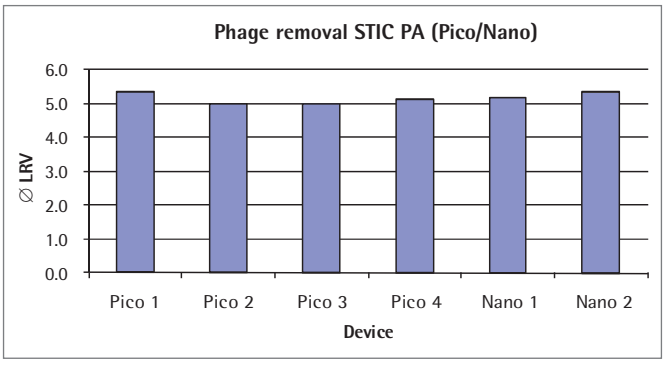
Comparable performance with larger device

4. Phage removal

Method
– 300 MV Equilibration
– 150 MV Load with Phage ΦX 174 in buffer (~ 1.5×10^7 PFU/mL)
– Sampling after 100 and 150 MV

Determination of the Log Reduction Value:

Volume [MV]	Pico 1	Pico 2	Pico 3	Pico 4	Nano 1	Nano 2
100	5.4	5.1	5.1	5.3	5.2	5.5
150	5.5	4.9	4.8	5.1	5.3	5.3
Average	5.4	5.0	5.0	5.2	5.3	5.4



Comparable performance of Pico with Nano device

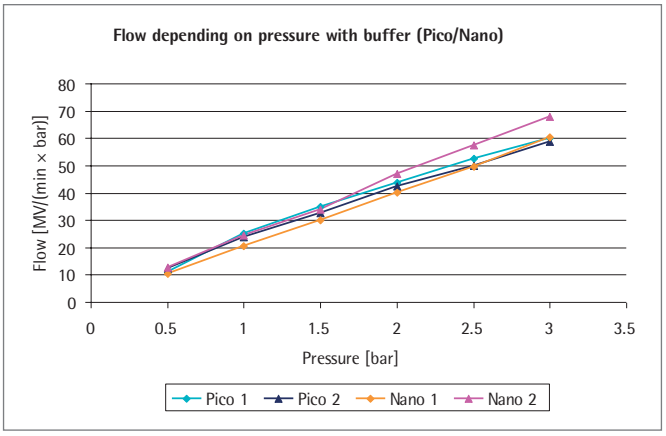
5. Breakthrough behavior with host cell protein

Method
– 100 MV Equilibration
– 100 MV Load with HCP diluted 1 : 50

Binding:

Device	Binding [mAu × MV]	Average
Pico 1	2262.00	
Pico 2	2711.00	
Pico 3	2636.00	
Pico 4	2652.00	2565.25
Nano 1	2474.00	
Nano 2	2454.00	2464.00

6. Flow rate



Flow rate >10 MV/(min × bar)

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