

ONYXTM
Finish First

Monolithic HPLC Columns



phenomenex[®] 
...breaking with traditionSM

Do I NEED Onyx™?



**If you relate to any point below, the answer is...
a DEFINITE YES!**

- **Cutting run times by more than half would be a significant benefit**
- **I need to dramatically increase throughput**
- **Rapid screening is necessary in my lab**
- **I often have a backlog of samples**
- **I work in a DMPK environment**
- **I specialize in organic synthesis (i.e.-combinatorial chemistry)**
- **I have issues with high column backpressure**

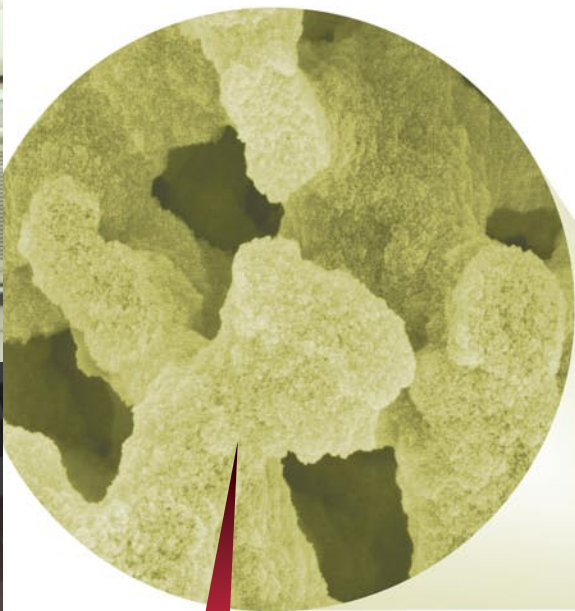
If you agreed with any of the above points, you will significantly benefit from using Onyx monolithic HPLC columns in your lab. The

following pages define what Onyx is and illustrate how this column will greatly improve productivity in your lab so you can finish first.

Bimodal Pore Structure

Onyx is a silica-based monolithic HPLC column. This technology creates highly porous rods of silica with a revolutionary bimodal pore structure.

The single piece of high-purity polymeric silica gel is then clad in PEEK tubing to make the finished product.



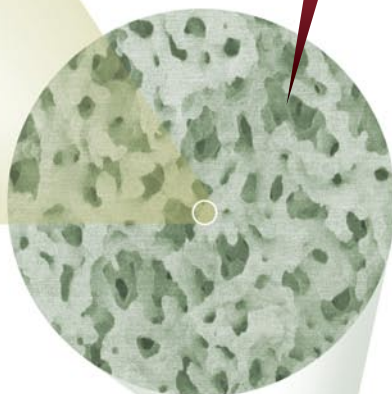
Mesoporous Structure Creates large surface area

The mesopores form the fine porous structure (130 Å) of the column interior and create a very large surface area on which adsorption of the target compounds can occur.

The unique combination of macropores and mesopores enables Onyx monolithic HPLC columns to provide excellent separations in a fraction of the time compared to a standard particulate column.

Macroporous Structure Allows rapid flow (up to 9 mL/min) at low pressures

Each macropore is on average 2 µm in diameter and together form a dense network of pores through which the mobile phase can rapidly flow at low pressure dramatically reducing separation time.



If you are not completely satisfied with Onyx within the first 45 days of use, KEEP THE COLUMN FOR FREE.

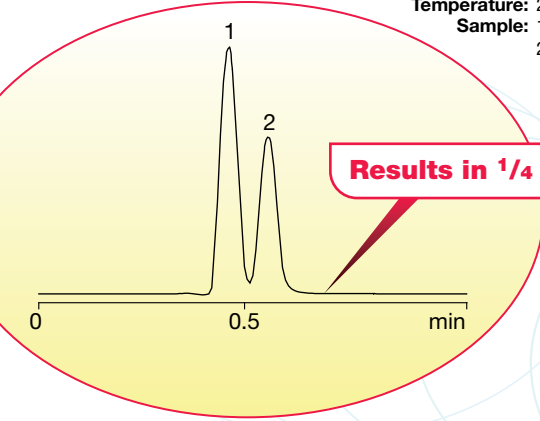
How will Onyx™ significantly benefit me and my research?

Dramatically increase sample throughput and reduce analysis time

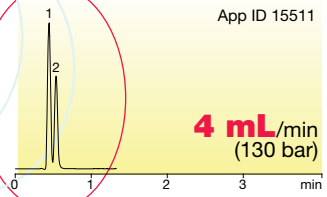
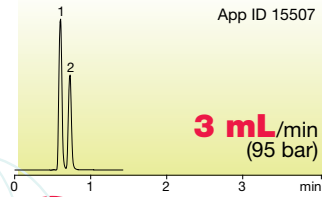
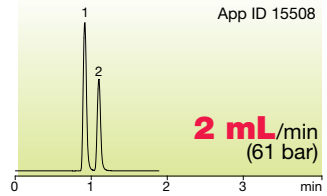
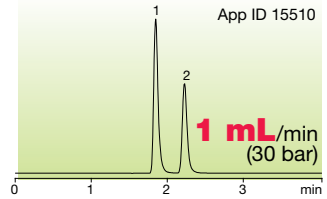
Cut run times by more than half!

Onyx columns give the option to run flow rates from 1 mL/min up to 9 mL/min with the same high quality resolution. Even at 9 mL/min, high backpressure is not a concern.

Column: Onyx Monolithic C18
Dimensions: 100 x 4.6 mm
Part No.: CH0-7643
Mobile Phase: 0.1 % TFA in water / Acetonitrile (95/5, v/v)
Flow Rate: 1 mL/min to 4 mL/min
Detection: UV @ 220 nm
Temperature: 22 °C
Sample: 1. Maleic Acid
2. Fumaric Acid



Results in 1/4 the time!

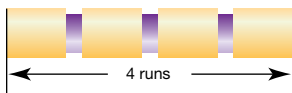


Quick re-equilibration

In a research environment, it is very common to run multiple samples under varied conditions. Therefore, the total working time of the column is not just the run time, but also the period required

to re-equilibrate the column between solvent gradient runs. Using Onyx you will not only dramatically reduce run time, but also equilibration time resulting in increased lab throughput.

Onyx monolithic column

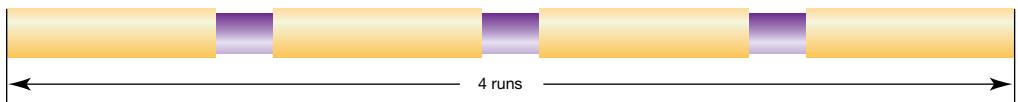


Who Will Finish First?

Fast equilibration and shorter run times allow more runs per hour than traditional columns.

■ Equilibration Time
■ Separation Time

Traditional particle-based column

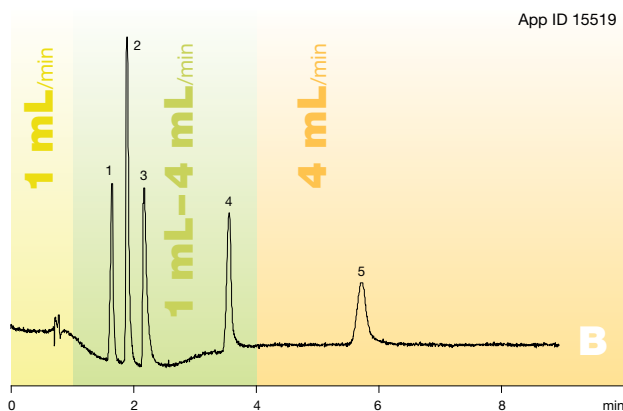
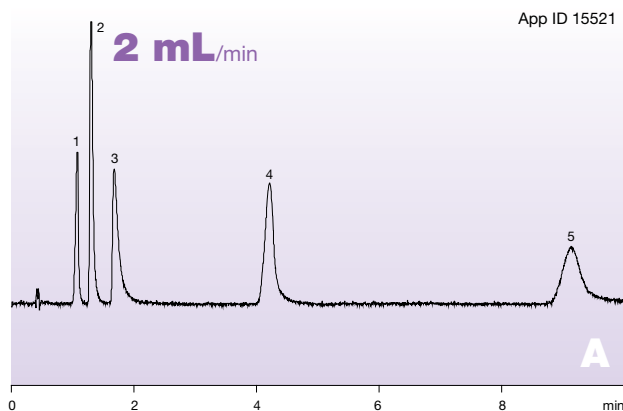


Experiment with flow gradient options

Onyx™ adds a new dimension for obtaining optimum separations in the fastest time. This parameter is Flow Rate.

Onyx columns are very responsive to changes in flow rate and can be changed in mid run to:

- Enhance peak definition of the target compound
- Shorten total separation time once the target compound has eluted
- More clearly separate two closely eluting peaks without significantly affecting total run time
- Reduce total run time when certain compounds elute much later than the other components of the sample



Column: Onyx Monolithic C18
Dimensions: 50 x 4.6 mm
Part No.: CH0-7644
Mobile Phase: 10 mM Potassium Phosphate
 pH 5.0 / Acetonitrile (97/3 v/v)

A) 2 mL/min

B) Flow rate program:

0 - 1 min 1 mL/min

1 - 4 min 1 mL/min – 4 mL/min

4 - 10 min 4 mL/min

Detection: UV @ 220 nm

Temperature: 22 °C

Sample: 1. p-Hydroxybenzoic acid

2. Saccharin

3. Salicylic Acid

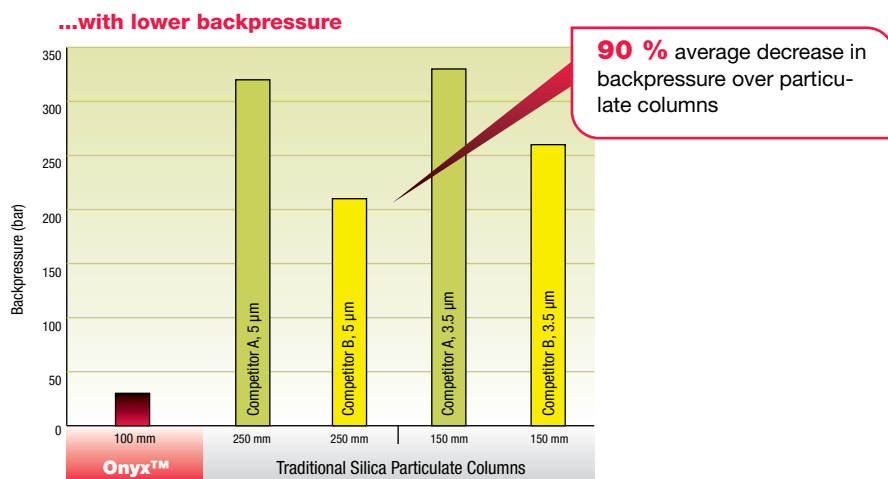
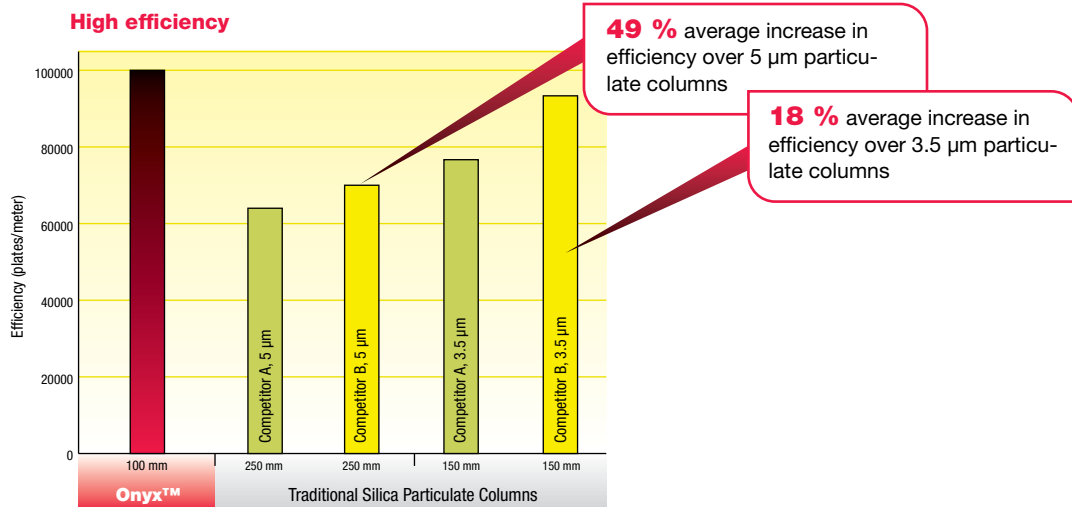
4. Sorbic Acid

5. p-Toluic Acid

How will Onyx™ significantly benefit me and my research?

Baseline resolve critical peaks

For closely related compounds, baseline separation can be a challenge. Having a column with high efficiency (plates/meter) can determine if those critical analytes co-migrate or are baseline resolved. As shown in the chart below, Onyx C18 has higher efficiencies compared to both 5 µm and 3.5 µm columns, thus making it an excellent column for resolving critical peaks.



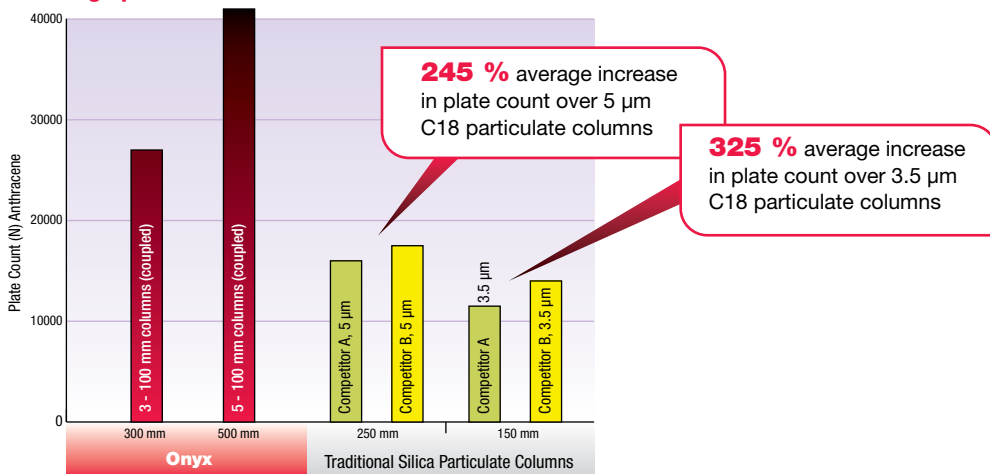
Conditions:

- Dimensions:** All 4.6 mm ID; length listed above in mm
- Mobile Phase:** Acetonitrile / Water (60:40)
- Flow Rate:** 3 mL/min
- Temperature:** 25 °C
- Sample:** 10 µL Anthracene (10 µg/mL)

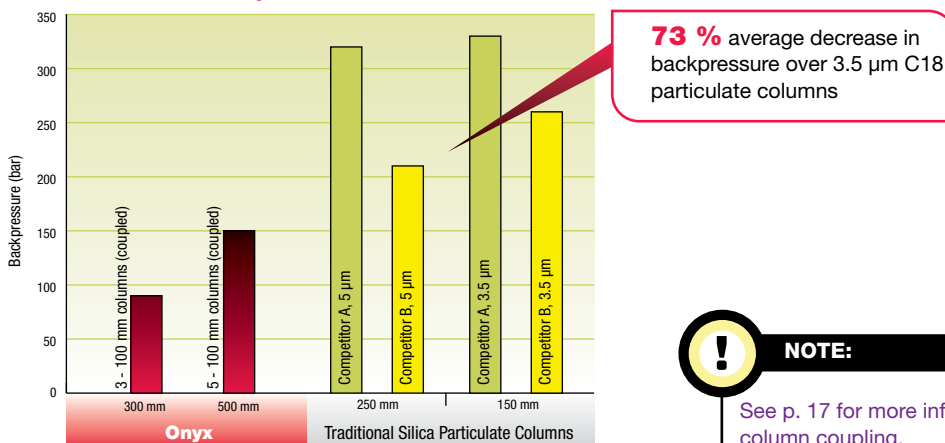
Excellent performance with minimal HPLC system stress

Although there is a trend towards using shorter columns packed with small particles, complex separations still require using longer column beds in order to provide the separation efficiency required to resolve all compounds of interest. Onyx™ columns can be linked in series with a column coupler, as done below, to produce a column with a theoretical plate count which is significantly higher than particulate columns, while producing pressures well below the HPLC system limit.

High performance



...with lower backpressure



Typical system limit: 400 bar / 5,800 psi



NOTE:

See p. 17 for more information on column coupling.

Conditions:

- Dimensions:** All 4.6 mm ID; length listed above in mm
- Mobile Phase:** Acetonitrile / Water (60:40)
- Flow Rate:** 3 mL/min
- Temperature:** 25 °C
- Sample:** 10 µL Anthracene (10 µg/mL)

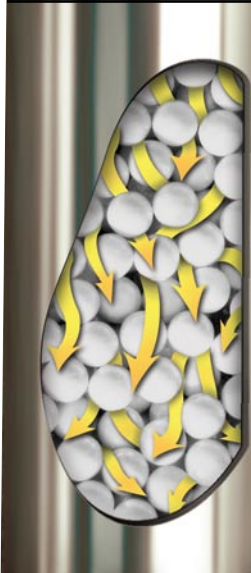
What makes Onyx™ superior to common particulate columns on the market?

Simple, IT GOES WITH THE FLOW!

Until recently, HPLC columns have been made of particulate materials, usually silica. By their very nature, small particles, when packed tightly into an

HPLC stainless steel column, create a significant resistance to the flow of the solvent/sample mixture along with other limitations highlighted below.

Traditional Silica “Particulate” Column



- **Individual silica particles**
- **High flow resistance:**
Limits ability to shorten run times
- **High backpressure:**
Reduces life of pumps, seals, and column
- **Reduced throughput:**
Long run times
- **Bed splitting possible:**
Shortens column life and affects reproducibility



Conditions

Columns: Onyx Monolithic C18

Traditional Silica

Particulate C18

Dimensions: 100 x 4.6 mm

Mobile Phase: Acetonitrile / 20 mM
Potassium phosphate
buffer, pH 2.5 (75:25, v/v)

Flow Rate: 1.5 mL/min

Detection: UV @ 210 nm

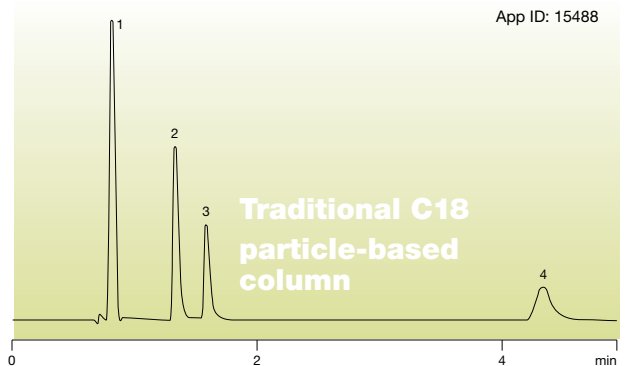
Temperature: Ambient

Sample: 1. Maleic Acid

2. Triprolidine

3. Chlorpheniramine

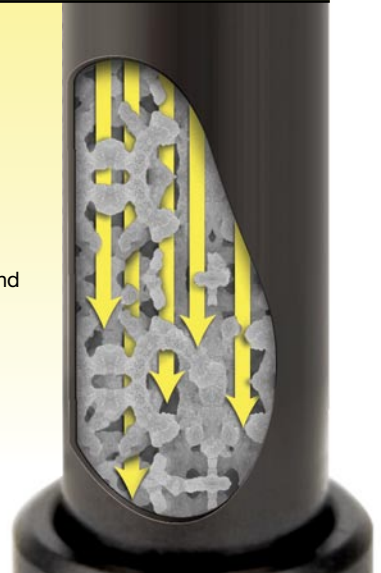
4. Diphenhydramine





“Monolithic” Column

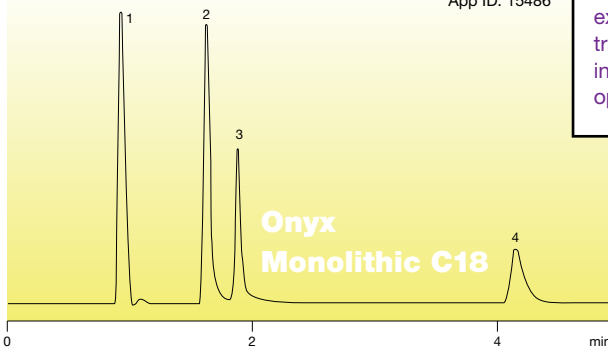
- **Monolithic porous silica rod**
- **High flow rates:**
Due to high porosity
- **Low backpressure:**
Less stress on system and column
- **Increased throughput:**
Significantly shorter run times
- **No inlet bed settling:**
Increased reliability, reproducibility, and lifetime



NOTE:

Because Onyx columns are based on ultra-pure silica, existing methods can easily be transferred with only minimal investment in new method development work.

App ID: 15486



What phase and dimension will work best for me?

Onyx Monolithic C18

- Selectivity comparable to conventionally packed C18 reversed phase columns
- For non-polar, basic, acidic, and metal chelating compounds.
- Use standard methods when developing a new protocol
- Manufactured with high-purity silica
- High ligand density
- Fully endcapped
- Available in 100 mm, 50 mm, and 25 mm lengths for speed options

Especially For The Bio Industry

150 x 0.1 mm dimensions

The Onyx Monolithic C18 in the 150 x 0.1 mm dimension combines high efficiency, peak capacity, and loadability all in a format for nano-LC proteomics applications. Monolithic silica technology is the solution for reduced sample loading time and column equilibration time; more analysis time means more proteins identified in complex mixtures.

- For efficient and selective separation of peptides and protein digests
- Low column backpressure allows for sample loading at high flow rates (2-4 $\mu\text{L}/\text{min}$) reducing sample loading times.
- Rapid re-equilibration further reduces “dead” time improving productivity.
- High efficiency separation across a wide range of flow rates (200 nL - 4 μL) allows for optimization of time and sensitivity.
- Equipped with standard $1/16$ inch PEEK fittings and sleeves
- Direct coupling, with zero void volume, to mass spectrometers

Silica Type:	High Purity
Particle Size:	Monolithic
Macropore Size:	2 μm
Mesopores Size:	13 nm (130 Å)
Pore Volume:	1 mL/g
Total Porosity:	> 80 %
Surface Area:	300 m ² /g
Surface Modification:	RP-18 endcapped
Carbon Content:	18 %

C18



ATTENTION:

Method developers, QC labs, and Validation laboratories:

Onyx monolithic C18 columns are available in a validation kit. The kit contains three columns, each derived from a different batch in order to compare batch-to-batch reproducibility and quality.



If you are looking for different selectivity than that of a C18 reversed phase, the Onyx line offers both a C8 bonded phase and unbonded bare silica (Si). Both these phases are available in the 100 x 4.6 mm dimension and offer alternative selectivity for those separations that do not work well on a C18.

C8

Onyx Monolithic C8

- Shorter alkyl chain offers less retention
- Slightly different selectivity than C18
- Fully endcapped

Silica Type:	High Purity
Particle Size:	Monolithic
Macropore Size:	2 μm
Mesopores Size:	13 nm (130 \AA)
Pore Volume:	1 mL/g
Total Porosity:	> 80 %
Surface Area:	300 m^2/g
Surface Modification:	RP-8 endcapped
Carbon Content:	11 %



Onyx Monolithic Silica (Si)

- Normal-phase material
- Suitable for separating polar non-ionic organic compounds
- Can be used for in-situ surface modifications for special separation procedures

Silica Type:	High Purity
Particle Size:	Monolithic
Macropore Size:	2 μm
Mesopores Size:	13 nm (130 \AA)
Pore Volume:	1 mL/g
Total Porosity:	> 80 %
Surface Area:	300 m^2/g



Si

New Onyx Semi-Prep Solution

Onyx Semi-Prep C18 is a silica monolithic C18 column now available in 100 mm x 10 mm ID format for higher loading capacity. This format allows for flow rates from 5 to 35 mL/min with loading capacities approaching what is typically observed for some 21.2 mm ID particle-based columns. Such features make Onyx Semi-Prep C18 columns useful for combinatorial purification applications where speed and column capacity are important considerations.

A unique solution for increased loading capacity and high-throughput purification

Applications:

- **High speed purification**
The new preparative format allows 5 – 35 mL/min flow rate.
- **Combinatorial library purifications**
Onyx is well suited for high-throughput purifications where impure samples and abusive ballistic gradients are often encountered. Also, due to the physics of the monolith, the DMSO solvent slug is well mixed improving purification results.
- **Purification of sample loads too large for analytical scale**
Onyx has a high loading capacity due to the high surface area of the mesopores. Typical loads are 10-20 mg depending on the sample.
- **For very dirty or viscous samples**
Onyx has very low backpressures and excellent flow characteristics, which allow for injections of these difficult samples. In addition, Onyx columns are very resistant to column clogging at the inlet.

Improved results:

- Higher flow rates with lower backpressures
- Much higher loading capacity compared to analytical dimension
- Minimal clogging from sample contaminants
- Longer column lifetime



Combi-prep purification of Naproxen

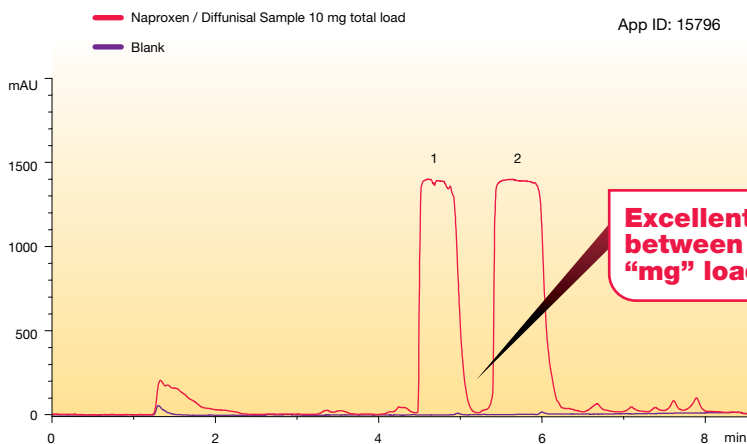
Background: High speed purification of a pharmaceutical compound injected in a large volume of DMSO.

Challenge #1: Purify large amounts (10 mg) of closely eluting compounds in less than 10 minutes.

Solution: The high efficiency and high surface area of Onyx C18 semi-prep columns demonstrates high loading capacity versus particle-based columns of the same dimension.

Challenge #2: Deliver long column lifetimes for “dirty” Combi-prep samples

Solution: Onyx 10 mm ID columns are fritless; removing a common source of column clogging and overpressures. In addition, the solid monolith rod is impervious to peak splitting caused by column void formation; a common problem with particulate combi-prep columns.



Column: Onyx Monolithic C18
Dimensions: 100 x 10.0 mm
Part No.: CH0-7878
Mobile Phase: A: 0.1 % TFA in Water
 B: 0.1 % TFA in Acetonitrile
Gradient: Hold at 30 % B from 0 - 1 minutes
 30-70 % B from 1 - 7 minutes, back to 30 % B and hold for 3 min
Flow Rate: 5.0 mL/min
Temperature: Ambient
Detection: UV @ 254 nm
Injection: 100 µL in DMSO
Sample: 1. Naproxen 50 mg/mL
 2. Diflunisal 50 mg/mL



Phenols

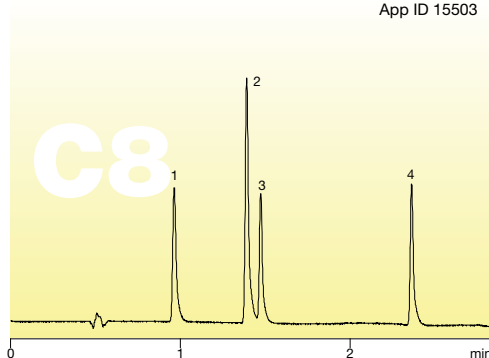
App ID 15503

Column: Onyx Monolithic C8
Dimensions: 100 x 4.6 mm
Part No.: CH0-7647
Mobile Phase: A: 0.1 % Phosphoric Acid
 B: Acetonitrile

Gradient:	Time	% A	% B
	0.0 min	70	30
	2.0 min	20	80

Flow Rate: 3 mL/min
Detection: UV @ 254 nm
Temperature: 22 °C

Sample: 1. Phenol
 2. 2,4-Dinitrophenol
 3. 3,4-Dinitrophenol
 4. Pentachlorophenol



Vitamins

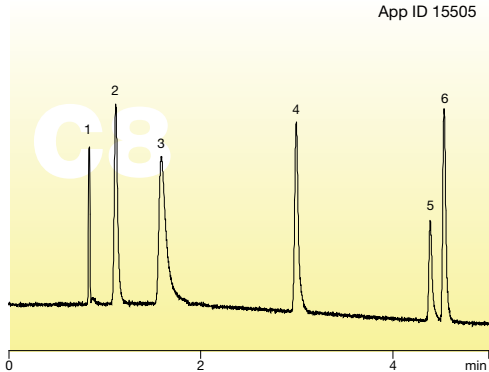
App ID 15505

Column: Onyx Monolithic C8
Dimensions: 100 x 4.6 mm
Part No.: CH0-7647
Mobile Phase: A: 20 mM Potassium Phosphate, pH 3.0
 B: Acetonitrile

Gradient:	Time	% A	% B
	0.0 min	100	0
	6.0 min	75	25

Flow Rate: 2 mL/min
Detection: UV @ 254 nm
Temperature: 22 °C

Sample: 1. Thiamine
 2. Uracil
 3. Niacinamide
 4. p-Aminobenzoic acid
 5. Riboflavin (Vitamin B2)
 6. Vitamin B12

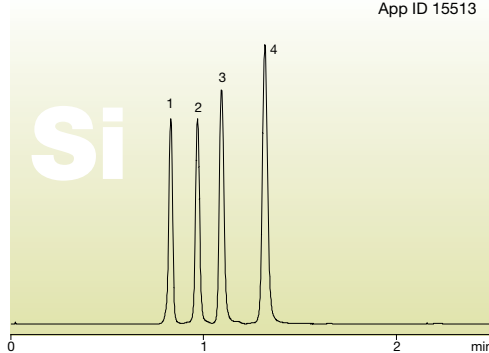


Anisoles

App ID 15513

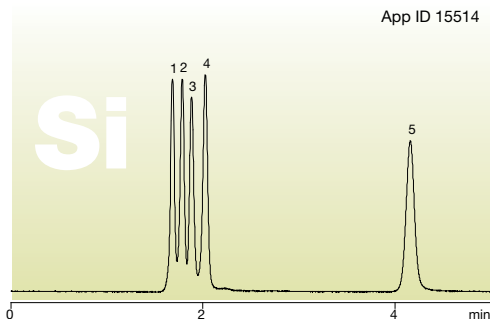
Column: Onyx Monolithic Si
Dimensions: 100 x 4.6 mm
Part No.: CH0-7648
Mobile Phase: Hexane/ Ethanol (95/5, v/v)
Flow Rate: 2 mL/min
Detection: UV @ 254 nm
Temperature: 22 °C

Sample: 1. Anisole
 2. 3-Nitroanisole
 3. 4-Nitroanisole
 4. 2-Nitroanisole



Phenones

Column: Onyx Monolithic Si
Dimensions: 100 x 4.6 mm
Part No.: CH0-7648
Mobile Phase: Hexane/ Ethanol (95/5, v/v)
Flow Rate: 1 mL/min
Detection: UV @ 254 nm
Temperature: 22 °C
Sample: 1. Octanophenone
 2. Butyrophenone
 3. Menadione
 4. Acetophenone
 5. Benzanilide

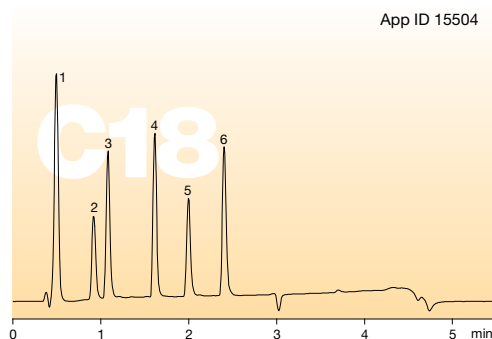


Sulfa Drugs

Column: Onyx Monolithic C18
Dimensions: 100 x 4.6 mm
Part No.: CH0-7643
Mobile Phase: A: 0.1 % TFA in Water
 B: Acetonitrile
Gradient:

Time:	% A	% B
0.0 min	90	10
4.0 min	50	50

Flow Rate: 4 mL/min
Detection: UV @ 254 nm
Temperature: 22 °C
Sample: 1. Sulfanilamide
 2. Sulfadiazine
 3. Sulfamerazine
 4. Sulfathoxazole
 5. Sulfaquinoxaline
 6. Sulfasalazine

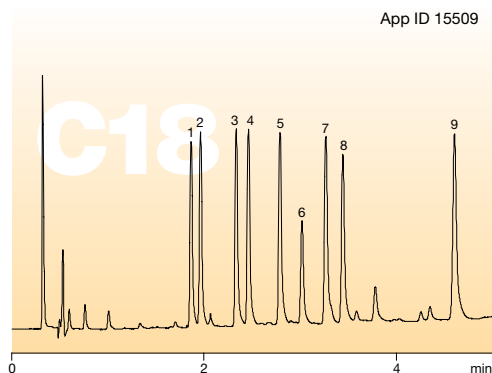


Steroids

Column: Onyx Monolithic C18
Dimensions: 100 x 4.6 mm
Part No.: CH0-7643
Mobile Phase: A: Water
 B: Acetonitrile
Gradient:

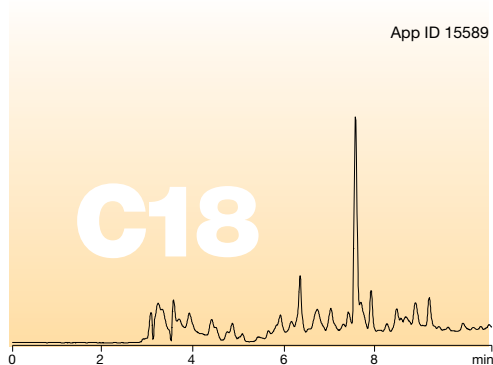
Time:	% A	% B
0.0 min	80	20
7.0 min	10	90

Flow Rate: 3 mL/min
Detection: UV @ 220 nm
Temperature: 22 °C
Sample: 1. Prednisolone
 2. Cortisone
 3. Betamethasone
 4. Corticosterone
 5. 11-Hydroxyprogesterone
 6. Estradiol
 7. 11-Ketoprogesterone
 8. Estrone
 9. Progesterone



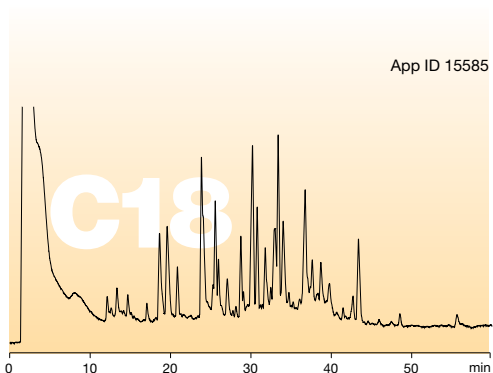
Cereal

Column: Onyx Monolithic C18
Dimensions: 200 x 4.6 mm
 (2 - 100 x 4.6 mm columns
 coupled in series)
Part No.: CH0-7643
Mobile Phase: A: 0.1 % TFA in Water
 B: 0.08 % TFA in Acetonitrile
Gradient: 5-70 % B in 15 minutes
Flow Rate: 1.0 mL/min
Detection: UV @ 280 nm
Temperature: 30 °C
Sample: Multi-grain cereal



β-Amylase Digest

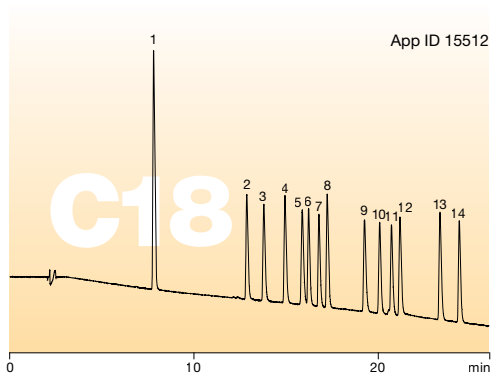
Column: Onyx Monolithic C18
Dimensions: 150 x 0.1 mm
Part No.: CH0-7646
Mobile Phase: A: 0.1 % TFA in Water
 B: 0.085 % TFA in Water / 95 %
 Acetonitrile
Gradient: 5-65 % B in 60 minutes
Flow Rate: 3.0 µL/min
Detection: UV @ 210 nm
Temperature: Ambient
Sample: β-Amylase Tryptic Digest



Pesticides

Column: Onyx Monolithic C18
Dimensions: 300 x 4.6 mm
 (3 - 100 x 4.6 mm columns
 coupled in series)
Part No.: CH0-7643
Mobile Phase: A: 10 mM Ammonium acetate, pH 7.0
 B: Acetonitrile
Gradient: 10-90 % B in 40 minutes
Flow Rate: 2 mL/min
Temperature: Ambient
Detection: UV @ 214 nm
Sample:

1. Fenuron	8. Diuron
2. Monuron	9. Propazine
3. Aminocarb	10. Siduron
4. Carbofuran	11. Methiocarb
5. Atrazine	12. Linuron
6. Fluometuron	13. Chlorpropham
7. Forchlorfenuron	14. Barban



Onyx™ Guard Cartridge System

Extend the life of your column

- Protect column against both chemical and particulate contamination
- Suitable for reversed phase chromatography
- Available in 5 mm and 10 mm length



Column Coupler

Don't let resolution be a limiting factor!

- Couple several columns together
- Enhance separation efficiency
- Produce significantly higher theoretical plate counts
- Backpressures maintained below HPLC system limit



Ordering information

Description	Size (mm)	Order No.	Price
Capillary Columns			
Onyx Monolithic C18	150 x 0.1	CH0-7646	\$ 840
Analytical Columns			
Onyx Monolithic C18	100 x 3.0	CH0-8158	\$ 775
Onyx Monolithic C18	100 x 4.6	CH0-7643	705
Onyx Monolithic C18	50 x 4.6	CH0-7644	555
Onyx Monolithic C18	25 x 4.6	CH0-7645	335
Other Phases Available			
Onyx Monolithic C8	100 x 4.6	CH0-7647	705
Onyx Monolithic Si	100 x 4.6	CH0-7648	705
Semi-Prep Columns			
Onyx Monolithic C18	100 x 10.0	CH0-7878	\$1,495
Guard Cartridge System			
Onyx Monolithic C18 Guard Cartridge Kit (3 pk cartridges + holder + wrench)	5 x 4.6	KJ0-7651	\$ 230
Onyx Monolithic C18 Guard Cartridges (3/pk)	5 x 4.6	CH0-7649	155
Onyx Monolithic C18 Guard Cartridge Kit (3 pk cartridges + holder + wrench)	10 x 4.6	KJ0-7652	245
Onyx Monolithic C18 Guard Cartridges (3/pk)	10 x 4.6	CH0-7650	195
Method Validation Kit			
Onyx Monolithic C18 Method Validation Kit (3 columns from different batches)	100 x 4.6	KH0-7653	\$ 2,100
Column Coupler			
Onyx Column Coupler		AQ0-7654	\$ 39
Column Performance Check Standards			
Onyx Monolithic NP (Normal Phase) for Si (Silica) columns, 2 mL		AL0-7835	\$ 39
Onyx Monolithic RP (Reversed-Phase) for C8 and C18 columns, 2 mL		AL0-7836	39



If you are not completely satisfied with Onyx within the first 45 days of use, KEEP THE COLUMN FOR FREE.