

## FINISH FIRST WITH MONOLITHIC SILICA HPLC COLUMNS

Phenomenex is proud to introduce Onyx, a silica monolithic HPLC column. The monolithic nature of this product will give scientists opportunities not common with particle-based columns.

- Reduce run times by more than 50 %
- Rapid screening and increased sample throughput
- "Dilute-and-Shoot" dirty biological samples
- Extremely high efficiencies without backpressure limitations
- Available in C18, C8, and Si phases
- Analytical, capillary, and semi-prep dimensions

If Onyx does not provide at least an equivalent separation as compared to a competing column of the same monolithic characteristics, similar phase, and dimensions, send in your comparative data within 45 days and keep the Onyx column for FREE.

### Material Characteristics

Packing Material	Macropore Size (µm)	Mesopore Size (Å)	Pore Volume (mL/g)	Surface Area (m <sup>2</sup> /g)	Carbon Load %	Calculated Bonded Phase Coverage (µmole/m <sup>2</sup> )	End Capping
Onyx Silica	2	130	1.0	300	0	0	No
Onyx C8	2	130	1.0	300	11	—	Yes
Onyx C18	2	130	1.0	300	18	3.6	Yes

Maximum Pressure: 200 Bar; pH Range: 2.0-7.5

## Monolithic Technology vs. Particle-Based Technology

### Onyx:

- Monolithic porous silica rod
- Significantly shorter run times
  - Cut methods by more than half
- Low backpressures
  - Less stress on system and column
- High flow rates
  - Due to high porosity
- No inlet bed settling
  - Increased reliability, reproducibility, and lifetime



### Particle-Based Columns:

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

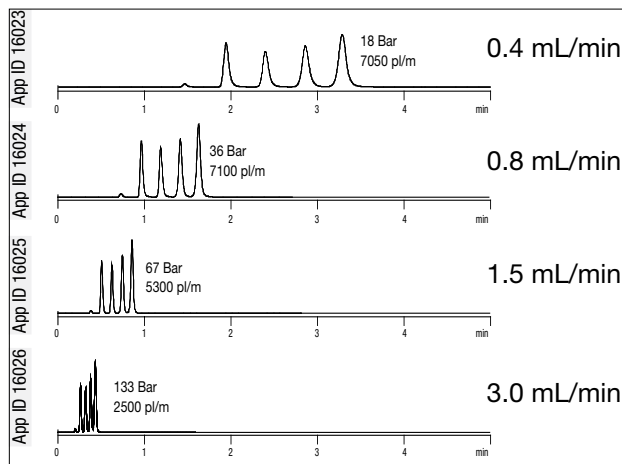


Onyx is a trademark of Phenomenex, Inc.

## Dramatically increase throughput and reduce analysis time

Onyx provides excellent efficiencies and low backpressures under a variety of conditions. Whether the goal is to baseline resolve a large mixture of analytes, or to complete a separation in less than 2 minutes, Onyx is an excellent choice.

- Option to run from 1 mL/min up to 9 mL/min
- Reduce re-equilibration time from sample to sample
- Shorten total separation time once target compound has eluted with flow gradient options



### Flow Rate and Peak Efficiency Comparisons

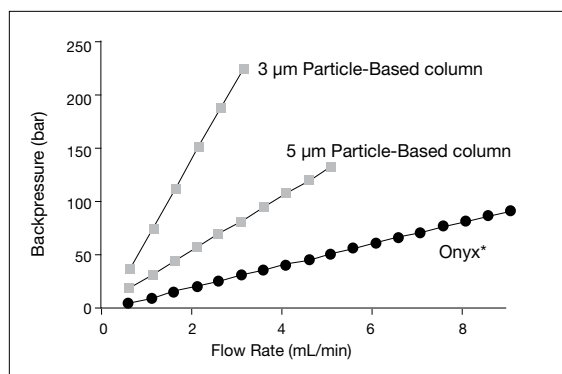
**Column:** Onyx Monolithic C18  
**Dimensions:** 100 x 3.0 mm  
**Part No.:** CH0-8158  
**Mobile Phase:** Acetonitrile / Water (65:35)  
**Flow Rates:** 0.4-3.0 mL/min  
**Detection:** UV @ 254 nm  
**Temperature:** Ambient  
**Sample:**  
 1. Uracil  
 2. Acetophenone  
 3. Benzene  
 4. Toluene  
 5. Naphthalene

## Extremely low backpressure

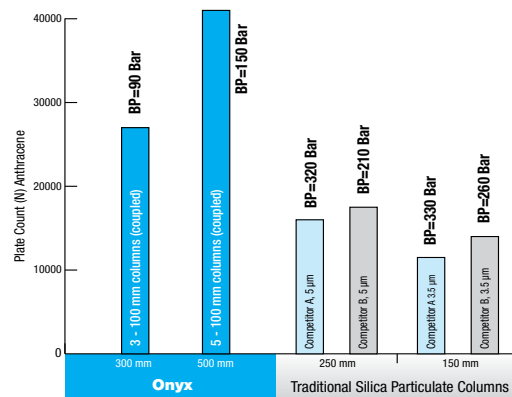
The very high porosity of Onyx results in very low backpressures, even at high flow rates. Onyx silica monolithic columns rarely exceed 100 bar, even at 9 mL/min, while particle-based columns reach backpressure limits at much lower flow rates.

- Typically 60 % less backpressure than particle-based columns
- Couple columns together to produce extremely high plate counts to separate critical pairs
- Minimal worry of system shutdowns from high backpressure

### Backpressure vs. Flow Rate



### High Plate Counts via Column Coupling



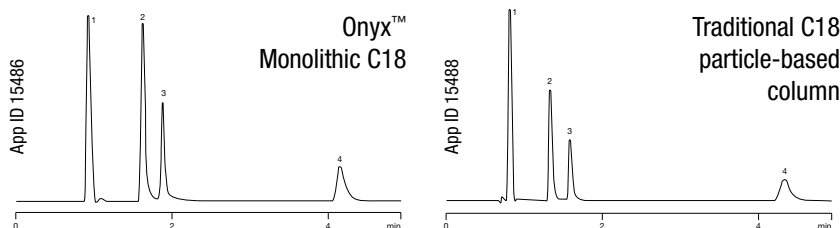
### Conditions

**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)

## Easy method transfer

Onyx columns, which are currently available with C8 and C18 surface modifications and endcapping, are comparable in selectivity to conventional reversed-phase, particle-based columns. Easily decrease the run times of your current method by transferring it to an Onyx column and then simply increasing the flow rate.

### Comparable Selectivity



### Hydrophobic Bases at Low pH

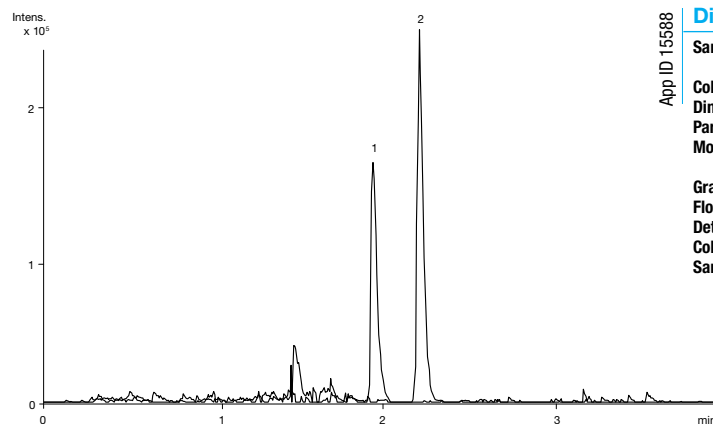
<b>Columns:</b>	Onyx Monolithic C18 Traditional Silica Particulate C18
<b>Dimensions:</b>	100 x 4.6 mm
<b>Mobile Phase:</b>	Acetonitrile / 20 mM Potassium phosphate buffer, pH 2.5 (75:25, v/v)
<b>Flow Rate:</b>	1.5 mL/min
<b>Detection:</b>	UV @ 210 nm
<b>Temperature:</b>	Ambient
<b>Sample:</b>	1. Maleic Acid 2. Triprolidine 3. Chlorpheniramine 4. Diphenhydramine

## Unique solutions for a variety of industries

In addition to high speed, Onyx silica monolithic columns provide unique solutions for various industries and applications ranging from biomarker research to beverage identity testing.

### Pharmaceutical / DMPK:

- Excellent for "dilute and shoot" applications due to the low potential of dirty, viscous samples clogging the large macropores
- Significantly increase throughput with rapid gradients and very short re-equilibration times
- Low carryover from urine and plasma samples

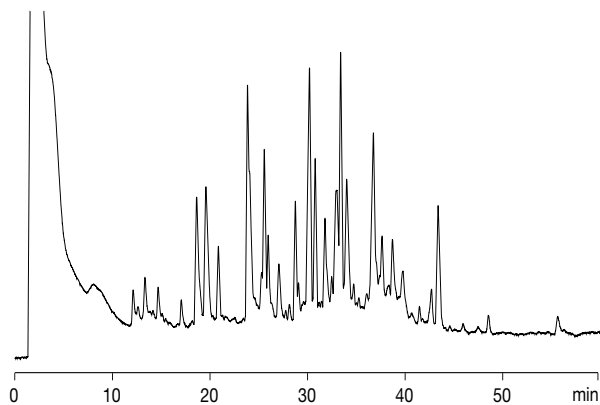


### Diazepam and Metabolite in Urine

<b>Sample Prep:</b>	Human urine sample diluted 1:1 with water. 50 µL injected
<b>Column:</b>	Onyx Monolithic C18
<b>Dimension:</b>	100 x 4.6 mm
<b>Part No.:</b>	CHO-7643
<b>Mobile Phase:</b>	A) 0.1 % Formic acid in Water B) 0.1 % Formic acid in Acetonitrile
<b>Gradient:</b>	5-90 % B in 4.0 minutes
<b>Flow Rate:</b>	4.0 mL/min
<b>Detection:</b>	LC/MS ESI+
<b>Col. Temperature:</b>	30 °C
<b>Sample:</b>	1. Nordiazepam (Diazepam metabolite) (m/z=271) 2. Diazepam (m/z=285)

## Biotechnology/proteomic and biomarker discovery:

- 150 x 0.1 mm (100 µm) dimension available for increased sensitivity
- High peak capacity due to improved flow characteristics of monolithic material
- Flow rate flexibility (200 nL/min - 10 µL/min) allows for rapid loading of sample directly onto column at high flow rates
- Decreased run-to-run carryover, due to monolithic nature, eliminates need for trap column



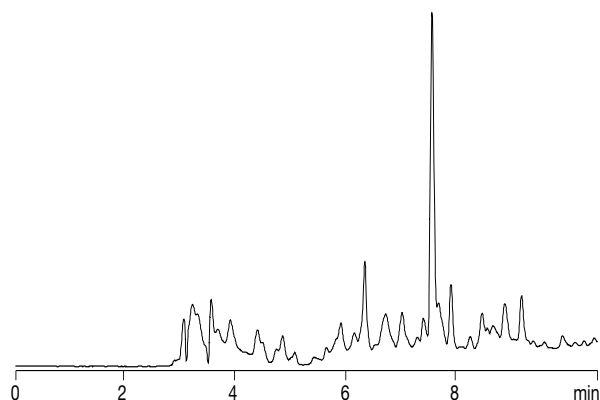
App ID 15585

### Tryptic digest of β-Amylase

**Column:** Onyx Monolithic C18  
**Dimension:** 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:** 1. β-Amylase Tryptic Digest

## Food and Beverage:

- Flow restrictions and overpressures, due to salts, precipitated proteins, and lipids in the sample matrix, are highly unlikely
- Increase resolving power of very complex food extracts by column coupling
- Analyze very dilute or low-level analytes by a direct, high-flow injection onto the column



App ID 15589

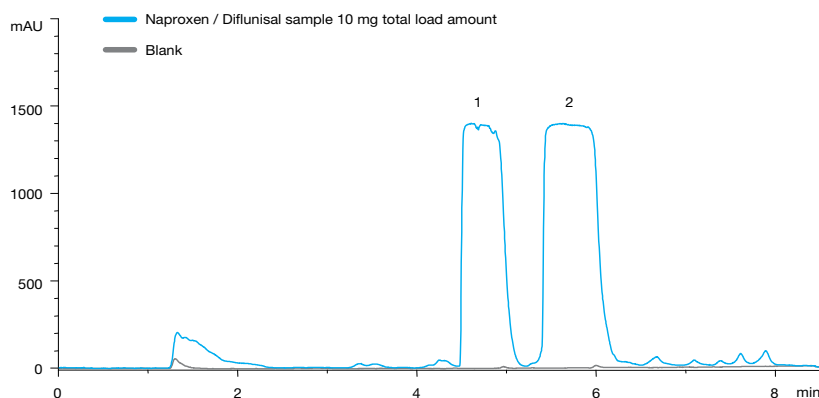
### Multi-Grain Cereal

**Column:** Onyx Monolithic C18  
**Dimension:** 200 x 4.6 mm  
 (2 x 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  
**Col. Temperature:** 30 °C  
**Sample:** 1. Multi-grain cereal

## 10 mm ID Onyx Semi-Prep Column

Onyx semi-prep silica monolithic C18 columns have been introduced into the Onyx line in order for scientists to have options for higher loadability than that of 4.6 mm columns, but still be able to run at extremely high flow rates for increased sample throughput. Such features make Onyx semi-prep columns a useful tool for combinatorial purification applications where speed and column capacity are an important consideration.

- Flow rates from 5 – 35 mL/min
- Loading capacities approaching what is typically observed on 21.2 mm ID columns for some samples
- Pore structure rapidly disrupts DMSO injection slug resulting in better mixing & improved binding of analyte to sorbent
- Long lifetimes when analyzing “dirty” samples due to monolithic nature



App ID 15796

### Naproxen and Diflunisal

**Column:** Onyx Monolithic C18  
**Dimensions:** 100 x 10 mm  
**Part No.:** CHO-7878  
**Mobile Phase:** A) 0.1 % TFA in Water  
 B) 0.1 % TFA in Acetonitrile  
**Gradient:** Hold at 30 % B for 1 min, then from 30 % B to 70 % B in 6 min, back to 30 % B and hold for 3 min  
**Flow Rate:** 5.0 mL/min  
**Detection:** UV @ 254 nm  
**Temperature:** Ambient  
**Sample:** 1. Naproxen 50 mg/mL  
 2. Diflunisal 50 mg/mL

HPLC

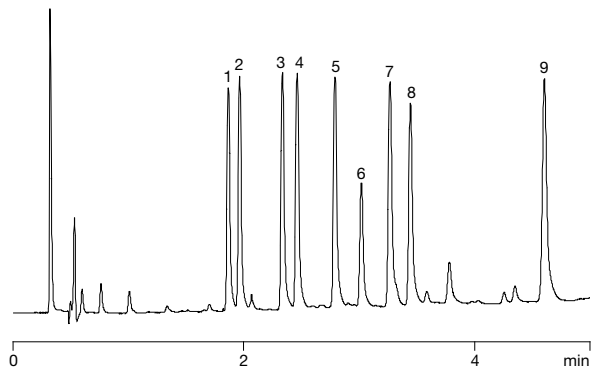
Onyx

## Applications

### Steroids

App ID 15509

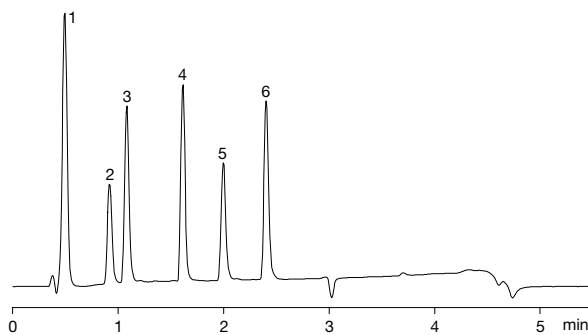
**Column:** Onyx Monolithic C18  
**Dimension:** 100 x 4.6 mm  
**Part No.:** CHO-7643  
**Mobile Phase:** A) Water  
 B) Acetonitrile  
**Gradient:** Time: % A % B  
 0.0 min 80 20  
 7.0 min 10 90  
**Flow Rate:** 3.0 mL/min  
**Detection:** UV @ 220 nm  
**Temperature:** 22 °C  
**Sample:** 1. Prednisolone  
 2. Cortisone  
 3. Betamethasone  
 4. Corticosterone  
 5. 11-Hydroxyprogesterone  
 6. Estradiol  
 7. 11-Ketoprogesterone  
 8. Estrone  
 9. Progesterone



### Sulfa Drugs

App ID 15504

**Column:** Onyx Monolithic C18  
**Dimension:** 100 x 4.6 mm  
**Part No.:** CHO-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:** 4.0 mL/min  
**Detection:** UV @ 254 nm  
**Temperature:** 22 °C  
**Sample:** 1. Sulfanilamide  
 2. Sulfadiazine  
 3. Sulfamerazine  
 4. Sulfathoxazole  
 5. Sulfaquinoxaline  
 6. Sulfasalazine

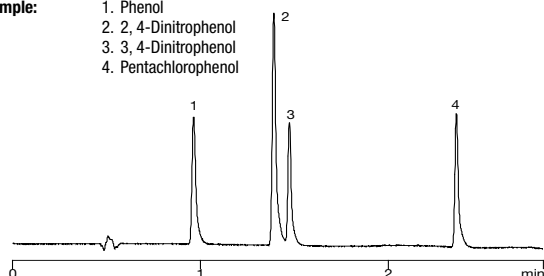


## Applications (cont'd)

### Phenols

App ID 15503

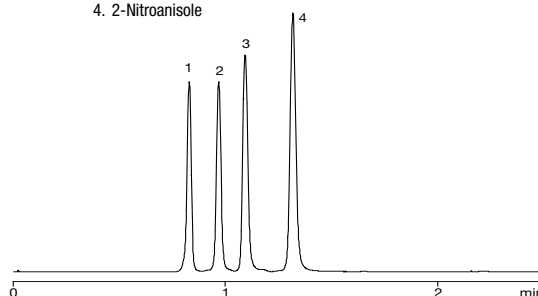
**Column:** Onyx Monolithic C8  
**Dimension:** 100 x 4.6 mm  
**Part No.:** CH0-7647  
**Mobile Phase:** A) 0.1 % Phosphoric Acid  
 B) Acetonitrile  
**Gradient:** Time: % A % B  
 0.0 min 70 30  
 2.0 min 20 80  
**Flow Rate:** 3.0 mL/min  
**Detection:** UV @ 254 nm  
**Temperature:** 22 °C  
**Sample:** 1. Phenol  
 2. 2, 4-Dinitrophenol  
 3. 3, 4-Dinitrophenol  
 4. Pentachlorophenol



### Anisoles

App ID 15513

**Column:** Onyx Monolithic Si  
**Dimension:** 100 x 4.6 mm  
**Part No.:** CH0-7648  
**Mobile Phase:** Hexane / Ethanol (95/5, v/v)  
**Flow Rate:** 2.0 mL/min  
**Detection:** UV @ 254 nm  
**Temperature:** 22 °C  
**Sample:** 1. Anisole  
 2. 3-Nitroanisole  
 3. 4-Nitroanisole  
 4. 2-Nitroanisole



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HPLC

Onyx

## Excellent Reproducibility

Several parameters, such as peak asymmetry and retention factors, were used to test the reproducibility of Onyx silica monolithic columns and ensure that every batch meets the quality control standards of chromatographers worldwide.

### Batch-to-Batch

Excellent consistency of retention in different batches have been shown. The retention factors, for the probes, were all within 5 % for all the columns.

## Column-to-Column

Acidic, basic, neutral polar, and neutral hydrophobic probes were evaluated on the same column to verify run-to-run reproducibility. The plots show less than 1 % variation between the run illustrating reproducibility.



Refer to technical note, TN-1025, for more information pertaining to Onyx reproducibility. Call your Phenomenex representative.

## ORDERING INFORMATION

Part No.	Description	Size (mm)	Price
<b>Capillary Columns</b>			
CH0-7646	Onyx Monolithic C18	150 x 0.1	
<b>Analytical Columns</b>			
CH0-8158	Onyx Monolithic C18	100 x 3.0	
CH0-7643	Onyx Monolithic C18	100 x 4.6	
CH0-7644	Onyx Monolithic C18	50 x 4.6	
CH0-7645	Onyx Monolithic C18	25 x 4.6	
CH0-7647	Onyx Monolithic C8	100 x 4.6	
CH0-7648	Onyx Monolithic Si	100 x 4.6	
<b>Semi-Prep Columns</b>			
CH0-7878	Onyx Monolithic C18	100 x 10.0	
<b>Guard Cartridge System</b>			
KJ0-7651	Onyx Monolithic C18 Guard Cartridge Kit (3 pk cartridges + holder + wrench)	5 x 4.6	
CH0-7649	Onyx Monolithic C18 Guard Cartridges (3/pk)	5 x 4.6	
KJ0-7652	Onyx Monolithic C18 Guard Cartridge Kit (3 pk cartridges + holder + wrench)	10 x 4.6	
CH0-7650	Onyx Monolithic C18 Guard Cartridges (3/pk)	10 x 4.6	
<b>Method Validation Kit</b>			
KH0-7653	Onyx Monolithic C18 Method Validation Kit (3 columns from different batches)	100 x 4.6	
<b>Column Coupler</b>			
AQ0-7654	Onyx Column Coupler		



Product based on monolithic technology under license from Merck KGaA, Darmstadt, Germany



For Onyx Normal and Reversed Phase Column Check Standards, see p. 88