



# Cole-Parmer®

## Cole-Parmer 1.7 $\mu\text{m}$ UHPLC Columns

[coleparmer.com](http://coleparmer.com)

# UHPLC Columns

- Optimized for Ultra-High Pressure LC (UHPLC)
- Available in 8 different selectivities
- Operate at 1200 bar (18,000 psi)




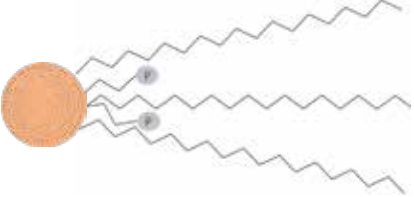



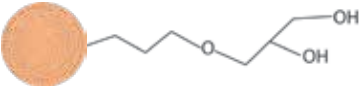
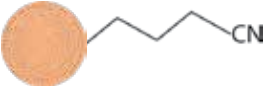
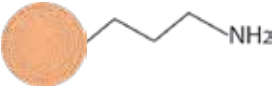
**Speed**

**Resolution**

**Selectivity**

**Sensitivity**

# Phase Chemistry Selectivity

	<p><b>C18</b></p> <ul style="list-style-type: none"> <li>– General UHPLC use</li> <li>– Method development from pH 1–12</li> </ul>	<p>Acids Bases Neutrals</p>
	<p><b>Polar endcapped C18</b></p> <ul style="list-style-type: none"> <li>– Polar endcapped</li> <li>– Increased polar retention</li> </ul>	<p>Hydrophilic analytes Organic acids Catecholamines</p>
	<p><b>Diphenyl</b></p> <ul style="list-style-type: none"> <li>– Unique diphenyl structure</li> <li>– Metabolite profiling</li> <li>– Separate positional isomers</li> </ul>	<p>Metabolites Positional isomers Hydrophilic / hydrophobic analytes</p>
	<p><b>C8</b></p> <ul style="list-style-type: none"> <li>– General UHPLC use</li> <li>– Method development</li> </ul>	<p>Lipids Steroids Highly hydrophobic analytes</p>
	<p><b>HILIC</b></p> <ul style="list-style-type: none"> <li>– High polar retention</li> <li>– Homogenous silanol concentration</li> <li>– Improve MS sensitivity</li> </ul>	<p>Carboxylic acids Nucleotides Vitamins</p>
	<p><b>DIOL</b></p> <ul style="list-style-type: none"> <li>– Alternate selectivity to bare silica</li> <li>– Stable bonding</li> <li>– HILIC or normal phase mode</li> </ul>	<p>Steroids Proteins Metabolites</p>
	<p><b>Cyano</b></p> <ul style="list-style-type: none"> <li>– Cyano functionality</li> <li>– Reversed phase or normal phase</li> </ul>	<p>Explosives Pesticides Steroids</p>
	<p><b>Amino</b></p> <ul style="list-style-type: none"> <li>– Reproducible, robust bonding</li> <li>– Reversed phase, normal phase or ion exchange mode</li> </ul>	<p>Saccharides Oligonucleotides Steroids</p>

# Cole-Parmer 1.7 $\mu\text{m}$ UHPLC Columns

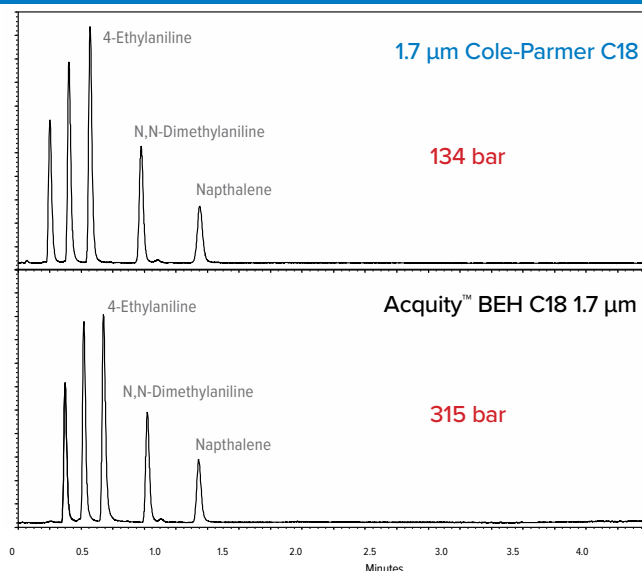
- Use 1.7  $\mu\text{m}$  Cole-Parmer particles as a traditional UHPLC column or in place of core-shell
- 380  $\text{m}^2/\text{g}$  surface area for increased peak capacity
- Available in 8 phase chemistries
- Operate to 1200 bar (18,000 psi)
- Fully pH stable 1 to 12
- Fully scalable to analytical

The 1.7  $\mu\text{m}$  Cole-Parmer UHPLC columns can be used in UHPLC systems or in standard 400 to 600 bar systems to produce ultra-high pressure or ultra-high performance chromatography. The 1.7  $\mu\text{m}$  particles are designed to be robust, reproducible and fully scalable with 3  $\mu\text{m}$  and 5  $\mu\text{m}$  particles. They will operate up to 1200 bar (18,000 psi) providing increased efficiency at high linear velocities, allowing speed and sensitivity to be achieved on all the latest UHPLC systems. By choosing a high surface area UHPLC phase, the analyst can increase peak capacity using their existing column dimension, or maintain existing capacity while lowering back pressure on a shorter column.

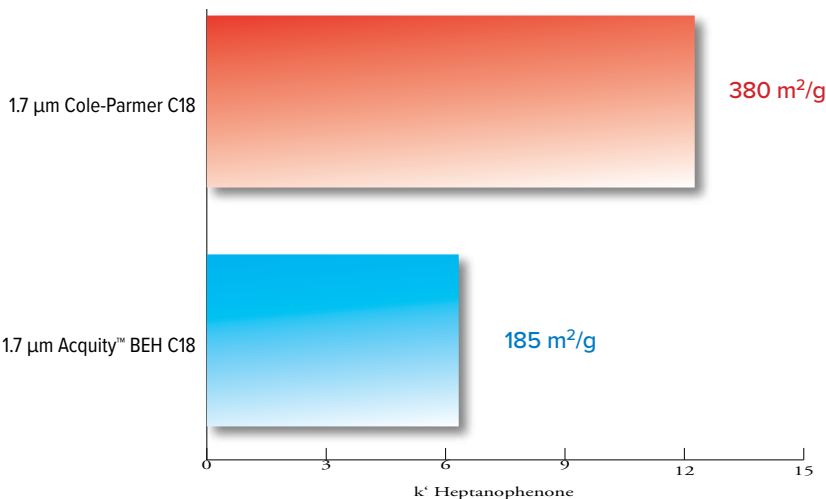
## High Efficiency with Lower Back Pressure

The 1.7  $\mu\text{m}$  Cole-Parmer C18 provides increased efficiency over 3  $\mu\text{m}$  and 5  $\mu\text{m}$  particles. This provides the opportunity to increase resolution or speed of analysis.

- Higher efficiency
- Lower back pressure



## Comparison of Hydrophobicity and Peak Shape



### 1.7 $\mu\text{m}$ Cole-Parmer C18, 50 x 2.1 mm

Surface area	380 $\text{m}^2/\text{g}$
Efficiency	191,670
Peak shape (N,N-Dimethylaniline)	1.03
Pressure - 0.4 mL/min (60:40 ACN:Water)	225 bar

### Acquity™ BEH 1.7 $\mu\text{m}$ C18, 50 x 2.1 mm

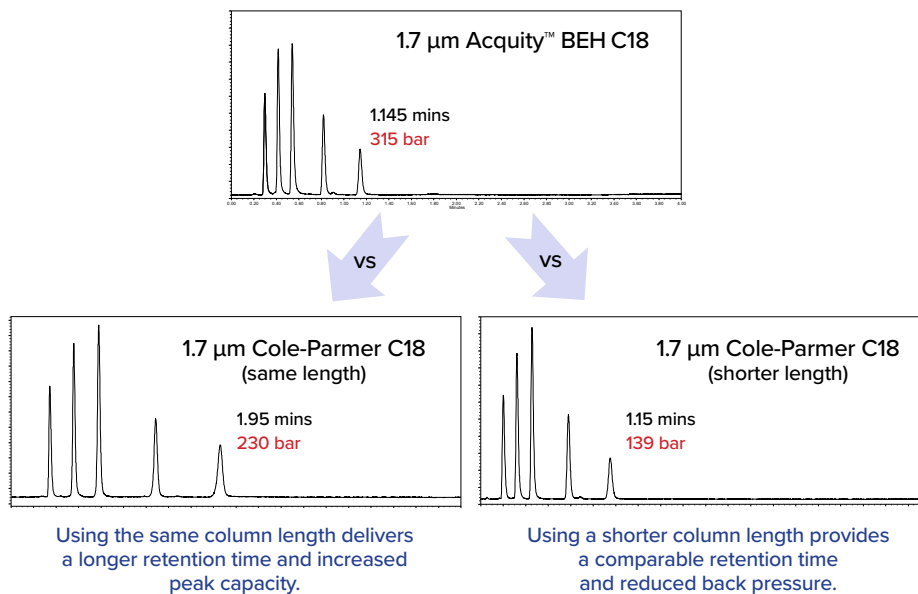
Surface area	185 $\text{m}^2/\text{g}$
Efficiency	167,400
Peak shape (N,N-Dimethylaniline)	1.28
Pressure - 0.4 mL/min (60:40 ACN:Water)	292 bar

# Comparisons

## Performance Comparison of 1.7 $\mu\text{m}$ Cole-Parmer C18 vs 1.7 $\mu\text{m}$ Acquity™ BEH C18

The high surface area of the silica 1.7  $\mu\text{m}$  Cole-Parmer C18 gives you the choice to increase retention/resolution or to lower back pressure compared to other manufacturer's columns.

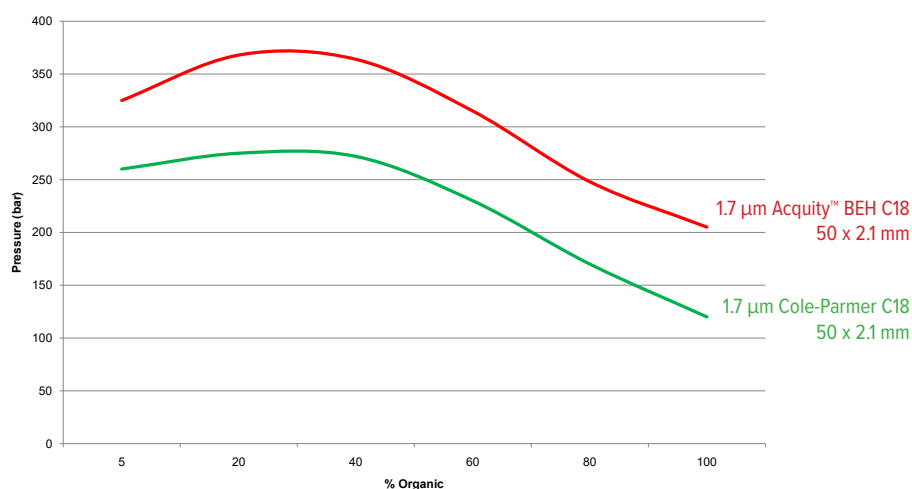
Increase peak capacity by using the same column length or use a shorter column to maintain the same retention while reducing back pressure.



## Pressure Comparison of 1.7 $\mu\text{m}$ Cole-Parmer C18 vs 1.7 $\mu\text{m}$ Acquity™ BEH C18

The high surface area of the 1.7  $\mu\text{m}$  Cole-Parmer C18 provides less back pressure than many of other UHPLC columns on the market.

You can decide to use a shorter column that will reduce the pressure with no loss of separation.

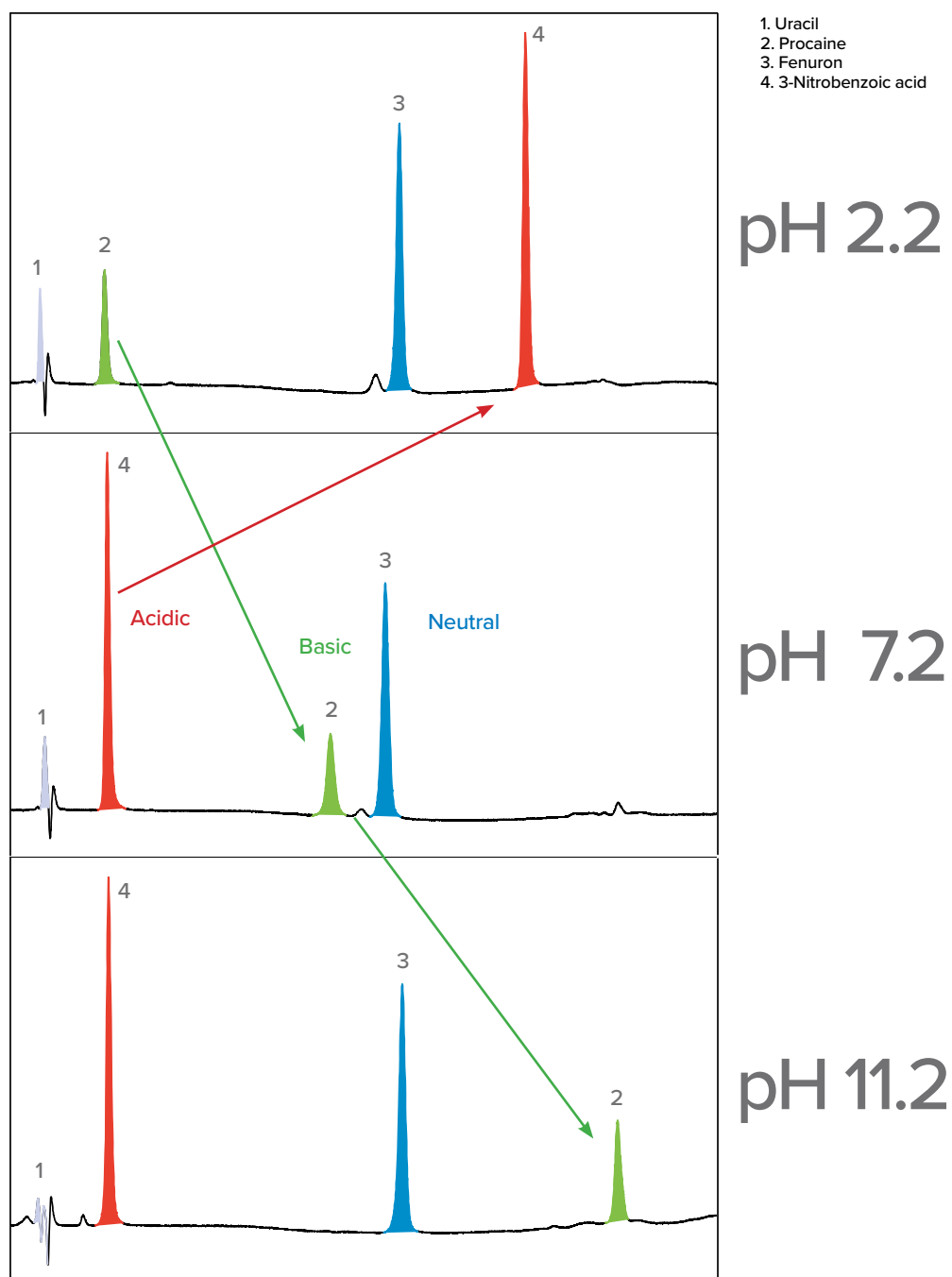




# 1.7 $\mu\text{m}$ Cole-Parmer C18 pH Options

- pH selectivity for method development
- pH stable 1 to 12
- Gives high speed of equilibration

The 1.7  $\mu\text{m}$  Cole-Parmer C18 will operate across the pH spectrum giving the analyst the ability to optimize the correct pH region for their separation. Quickly equilibrating from formic acid to ammonium acetate through to ammonia allows pH, as a method variable, to be rapidly evaluated. Resolution of compounds can be changed radically by altering pH to optimize separation between compound classes.



# Scalability and Sensitivity

## Fully Scalable

All Cole-Parmer phases can be scaled from 1.7  $\mu\text{m}$  all the way through analytical 3  $\mu\text{m}$  and 5  $\mu\text{m}$  particles without any change in retention profile.

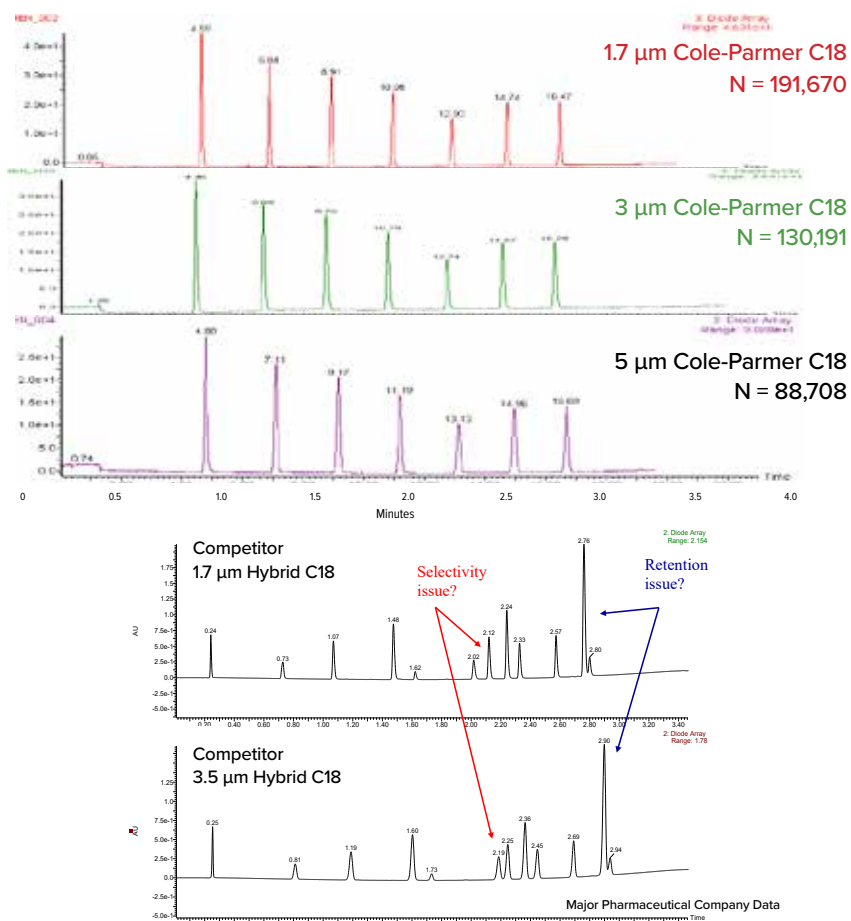
### – Facilitate method transfer

Using columns of identical chemistry and by adjusting flow rate, injection volume and gradient scaling, scaling up or down is possible without change in selectivity, making it easy to transfer methods between laboratories.

### – Avoid changes in resolution and retention

If a small particle used in UHPLC is not the same as its larger 3  $\mu\text{m}$  and 5  $\mu\text{m}$  particle then changes in resolution and retention can occur, neither of which are acceptable in method validation.

The 1.7  $\mu\text{m}$  Cole-Parmer C18 will alleviate all these potential issues, leaving the analyst confident in method transfer.



## Sensitivity Gains

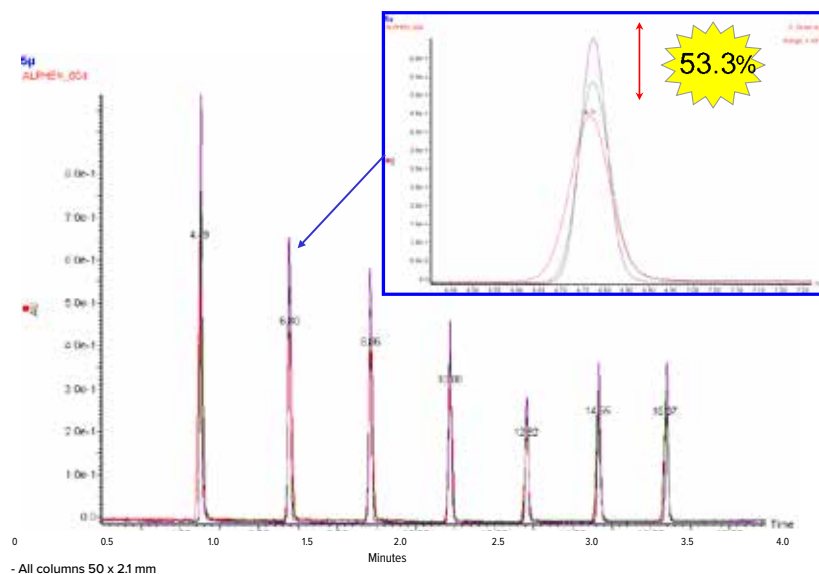
Peak height increases in UHPLC due to the rise in efficiency (N) from the smaller particle, but it is also inversely proportional to peak width, so symmetrical peaks will lead to increased sensitivity.

### – Sharp Peak Shapes

All Cole-Parmer phases are designed to give the sharpest possible peak shapes.

### – High Efficiency

Moving from 3  $\mu\text{m}$  to 1.7  $\mu\text{m}$  Cole-Parmer C18 gives a peak height increase of 27% in this example. The increase from 5  $\mu\text{m}$  particles is 53%.



# UHPLC Method Development

The 1.7  $\mu\text{m}$  Cole-Parmer columns will allow the transfer of methods from traditional HPLC to UHPLC, saving both time and solvent. If done properly the overall method time will be reduced but resolution and selectivity of solutes will remain constant or improve.

## Equivalent UHPLC Column — ‘Separating Power’

First consideration is the ability to scale the method down in column dimension, length and diameter:

### – Equivalent UHPLC column

If you can retain equivalent column plate count or ‘separating power’ then it is much easier to scale down effectively.

### – Example

If you move from a 5  $\mu\text{m}$  150 x 4.6 mm to a 1.7  $\mu\text{m}$  50 x 2.1 mm, the equivalent separation should be achieved but a several fold improvement in analysis time will be achieved.

Column length	Efficiency of 5 $\mu\text{m}$	Efficiency of 3 $\mu\text{m}$	Efficiency of 1.7 $\mu\text{m}$
250	22,000		
150	12,700	16,800	26,460
100	8,300	10,700	21,000
50	4,000	6,000	11,200
30		3,200	7,000
20			3,000



# UHPLC Method Development

## Scaling a Method — Isocratic

To scale to a UHPLC column, change the flow rate and injection volume in order to maintain the linear velocity across the method and not overload the column.

### – Change flow rate

$$F_2 = F_1 \times (Dc_2 / Dc_1)^2$$

### – Change injection volume

$$V_2 = V_1 \times \frac{(Dc_2^2 \times L_2)}{(Dc_1^2 \times L_1)}$$

$F_2$  = New flow rate

$F_1$  = Original flow rate

$Dc_2$  = New column diameter

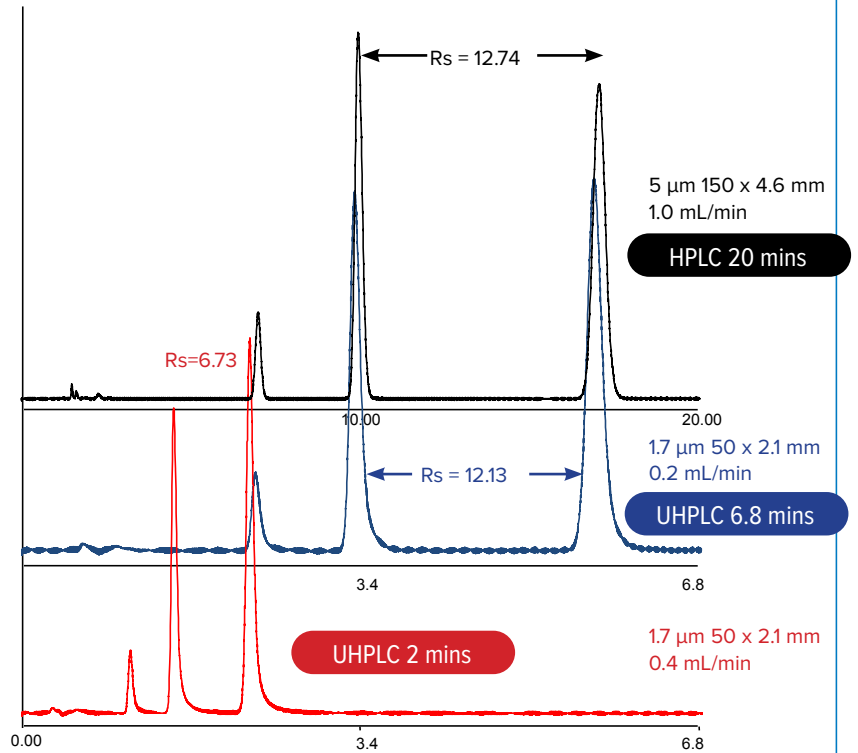
$Dc_1$  = Original column diameter

$L_2$  = Length of new column

$L_1$  = Length of original column

$V_2$  = New injection volume

$V_1$  = Original injection volume



## Scaling a Method — Gradient

In order to change our gradient, we must aim to keep the slope and the start point the same but lower the time the gradient runs in.

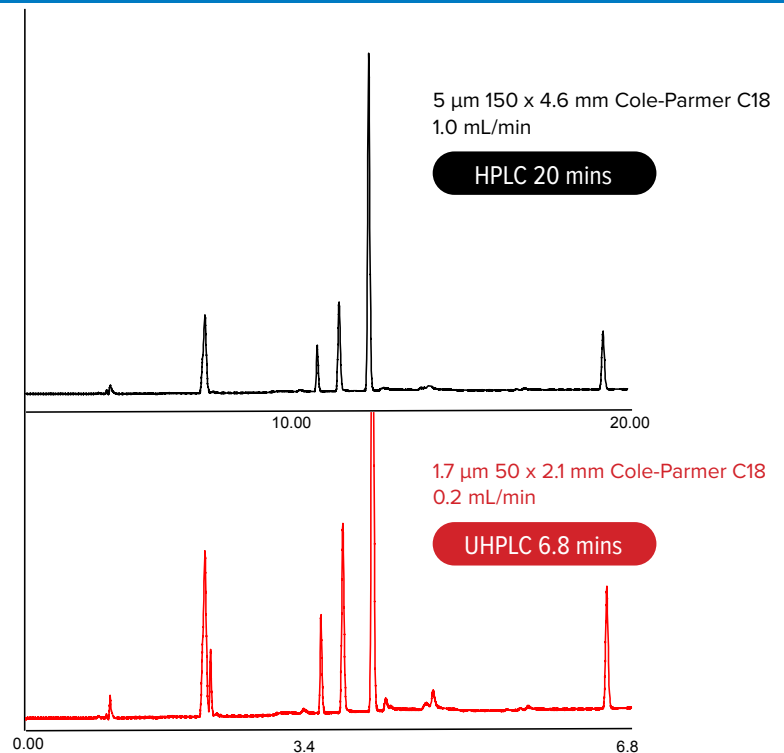
Altering the gradient time retains the same linear gradient and slope, but reduces the run time.

### – Change Gradient

$$tg_2 = tg_1 \times (F_1 / F_2) \times (Dc_2^2 / Dc_1^2) \times (L_1 / L_2)$$

$tg_2$  = New gradient time

$tg_1$  = Original gradient time



# UHPLC Method Development

## Resolution vs Efficiency vs Selectivity

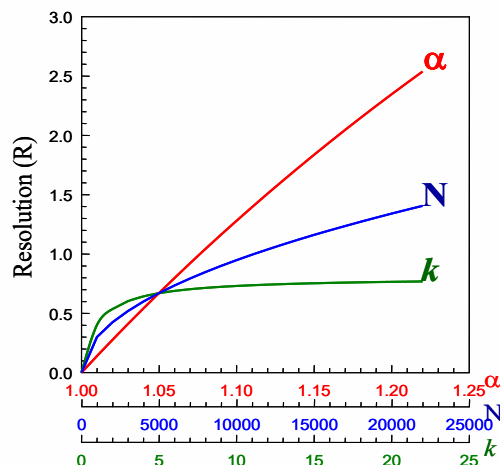
The 1.7  $\mu\text{m}$  Cole-Parmer C18 will provide hydrophobic selectivity which is suitable for many compounds. However as the resolution equation shows us having multiple phase chemistries available is a definite advantage even in UHPLC. Selectivity can then be used in conjunction with higher efficiency.

$$R = \frac{\sqrt{N}}{4} \cdot \frac{k'}{k'+1} \cdot \frac{\alpha-1}{\alpha}$$

Efficiency      Retention      Selectivity

$$\alpha = \frac{k_2}{k_1}$$

- Selectivity ( $\alpha$ ) has the greatest impact on improving resolution.

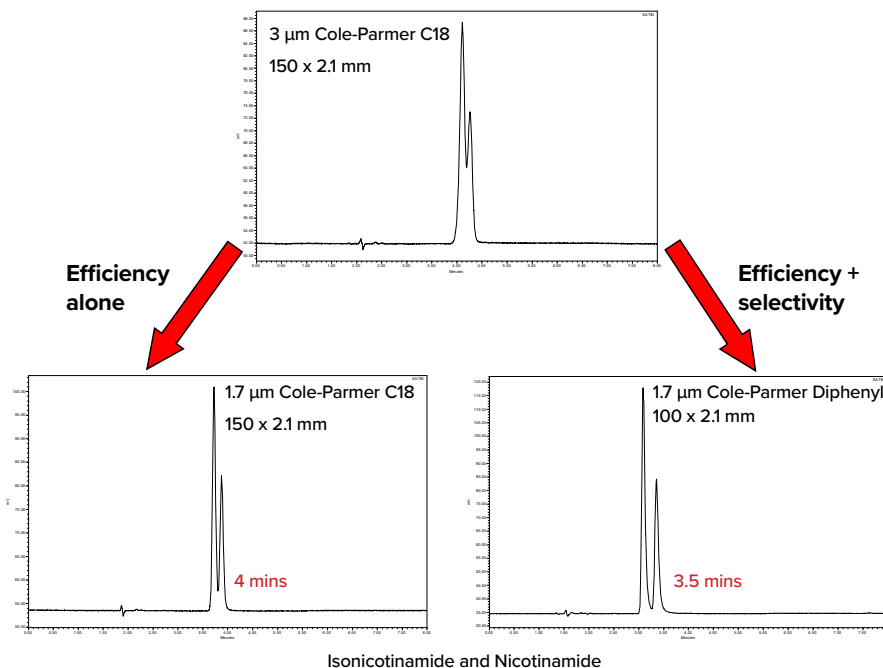


## Improve Selectivity

To scale a method, efficiency alone can't provide the necessary resolution.

Scaling from 3  $\mu\text{m}$  to 1.7  $\mu\text{m}$  does not provide baseline resolution between the compounds.

Selecting an alternative phase chemistry may be needed to achieve faster separation on a shorter column and achieve full baseline separation.



# UHPLC In-Line Filters



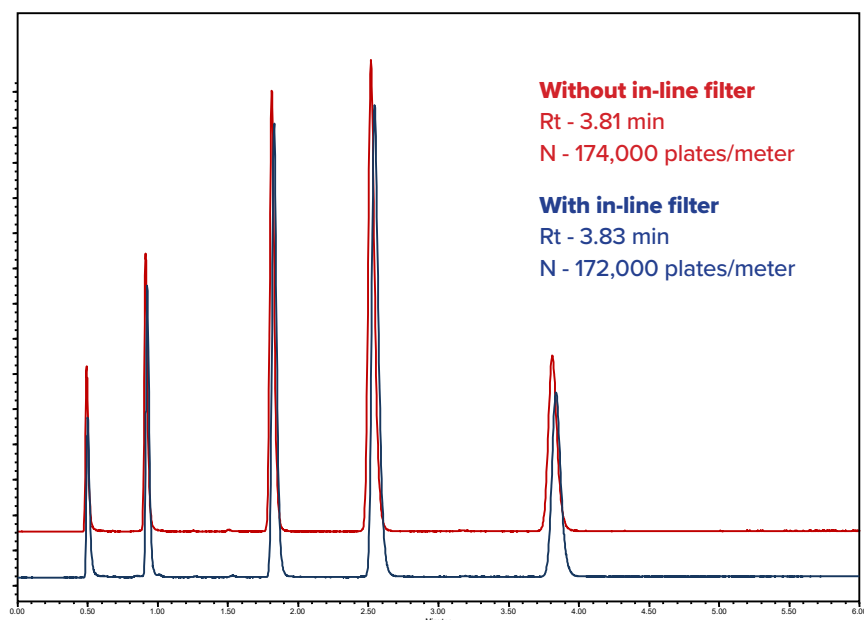
- Low volume in-line filters for all UHPLC columns
- No back pressure increase
- Increase lifetime of UHPLC columns
- Change-over time in seconds not minutes

## Column Protection — No Loss in Performance

Cole-Parmer UHPLC in-line filters are direct connect design, fitting in between the UHPLC column and the conventional system fitting to filter out particulate matter.

In-line filters are ideal for 1.7  $\mu\text{m}$  UHPLC columns where extra packed bed from a guard would be detrimental.

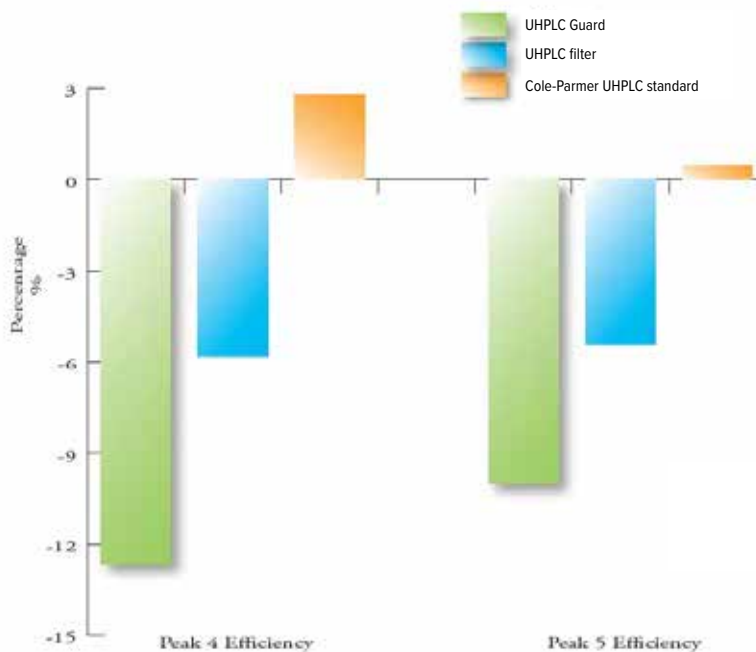
UHPLC in-line filters are manufactured to withstand 1379 bar (20,000 psi).



## Column Protection — No Loss in Performance

In-line filters are more suitable to many instances of UHPLC since with very short run times guard columns will add retention that is not required. Guards can also reduce the efficiency of the system.

All in-line filters are not the same and some filters may affect both efficiency and peak shape. Cole-Parmer in-line filters are optimized for UHPLC.



# Ordering Information

## Phase Characteristics

Chemistry	C18	Polar endcapped C18	Diphenyl	C8	HILIC	DIOL	Cyano	Amino
Carbon loading	17%	18%	13%	13%	N/A	4%	7%	5%
Particle size	1.7 µm	1.7 µm	1.7 µm	1.7 µm	1.7 µm	1.7 µm	1.7 µm	1.7 µm
Specific area	380 m <sup>2</sup> /g	380 m <sup>2</sup> /g	380 m <sup>2</sup> /g	380 m <sup>2</sup> /g	380 m <sup>2</sup> /g	380 m <sup>2</sup> /g	380 m <sup>2</sup> /g	380 m <sup>2</sup> /g
Pore size	100 Å	100 Å	100 Å	100 Å	100 Å	100 Å	100 Å	100 Å
pH range	1 to 12	2 to 10	2 to 9	2 to 10	2 to 8	2 to 8	2 to 7	2 to 8
USP classification	L1	L1	L11	L7	L3	L20	L10	L8



## UHPLC Columns

				C18	Polar end-capped C18	Diphenyl	C8	HILIC	DIOL	Cyano	Amino
Particle size	Length	Column ID	Qty	Item number	Item number	Item number	Item number	Item number	Item number	Item number	Item number
1.7 µm	50 mm	2.1 mm	1	16470-12	16470-54	16471-33	16470-33	16471-96	16471-75	16471-12	16471-54
		4.6 mm	1	16470-09	16470-51	16471-30	16470-30	16471-93	16471-72	16471-09	16471-51
	100 mm	2.1 mm	1	16470-11	16470-53	16471-32	16470-32	16471-95	16471-74	16471-11	16471-53
	150 mm	2.1 mm	1	16470-10	16470-52	16471-31	16470-31	16471-94	16471-73	16471-10	16471-52

## In-Line Filters

- Maintain chromatographic integrity and increase column lifetime
- Low-volume in-line filters change out in seconds, not minutes
- Place between column and fitting—no back pressure increase
- Fingertight direct connection



Description	Qty	Item number
In-line filters for UHPLC columns, 0.5 µm	2	16470-92
	4	16470-93

# Applications

Compound	Use	Column
1-Hydroxy-midazolam	Anxiolytic	C18
11 a-Hydroxyprogesterone	Steroid	Polar endcapped C18
11 a-Hydroxyprogesterone	Steroid	Cyano
17 a-Hydroxyprogesterone	Steroid	Polar endcapped C18
17-Hydroxyprogesterone	Hormone	C18
2,4-D	Herbicide	Cyano
2,4-DB	Herbicide	Cyano
2,4-DCP	Herbicide	C18
2,4-DP	Herbicide	Cyano
2,6-Dinitrotoluene	Explosives	Cyano
2-Hydroxybenzoic acid	Positional isomers	Diphenyl
2-Hydroxyestradiol	Positional isomers	Diphenyl
2-Nitroaniline	Explosives	Cyano
3-Hydroxyabsinthin	Sesquiterpene lactones	C18
3-Hydroxybenzoic acid	Positional isomers	Diphenyl
3-Methoxytyramine	Catecholamine	HILIC
3-Nitrobenzoic acid		C18
3-Octanon	Fragrance	C18
4-Ethylaniline		C18
4-Hydroxybenzoic acid	Positional isomers	Diphenyl
4-Hydroxyestradiol	Positional isomers	Diphenyl
4-Nitroaniline	Explosives	Cyano
5-HIAA	Catecholamines	Polar endcapped C18
6-Monacetylmorphine	Drugs of abuse	C18
7-Aminoclonazepam	Hypnotic	C18
7-Aminoflunitrazepam	Benzodiazepines	C18
7-Aminonitrazepam	Anxiolytic	C18
Absinthin	Sesquiterpene lactones	C18
Acetaminophen	Flu relief	C18
Acetic acid	Ear infections	C18
Adenine	Polars	HILIC
ALA	Amino acids	C18
Aldehydes	Aldehydes	C18
Alprazolam	Anxiolytic	C18
Amiloride	Diuretic	C18
Amitriptyline	Antidepressant	C18
Amoxicillin	Antibiotic	C18
Amphetamine	Drugs of abuse	C18
Amprenavir	HIV drugs	C18
Anabsin	Sesquiterpene lactones	C18
Anabsinthin	Sesquiterpene lactones	C18
Apigenin	Natural dyes	C18
ARG	Amino acids	C18
Artemisinin	Sesquiterpene lactones	C18

Compound	Use	Column
Ascorbic acid	Plant hormone	C18
Ascorbic acid	Vitamins	HILIC
ASP	Amino acids	C18
Atazanavir	HIV drugs	C18
Atenolol	Beta blocker	Polar endcapped C18
Atorvastatin	Statins	C18
Azithromycin	Antibiotic	C18
Banvel	Herbicide	C18
Bendroflumethiazide	Thiazide diuretic	Polar endcapped C18
Benoquinone acetic acid		Polar endcapped C18
Benzene	Alkyl benzenes	C18
Benzoylcegonine	Drugs of abuse	C18
Benzyladenine	Plant hormone	C18
Bromazepam	Benzodiazepines	C18
Butylbenzene	Alkyl benzenes	C18
Campher	Fragrance	C18
Candesartan cilexetil	Hypertension	C18
Cefachlor	Antibiotic	C18
Cefadroxil	Antibiotic	C18
Cefalexin	Antibiotic	C18
Cefradine	Antibiotic	C18
Chloramphenicol	Antibiotic	Polar endcapped C18
Cineol	Fragrance	C18
Ciprofloxacin	Antibiotic	Diphenyl
Citalopram	Antidepressant	C18
Clonazepam	Hypnotic	C18
Clopidogrel hydrogen SO <sub>4</sub>	Antiplatelet	C8
Clozapine	Drugs of abuse	C18
CMPP	Herbicide	Cyano
Co-amoxiclav	Antibiotic	C18
Co-codamol	Pain relief	C18
Cortisone	Anti-inflammatory	C18
CYS-CYS	Amino acids	C18
Cytosine	Nucleosides	HILIC
D3-Digitoxin	Cardiac glycosides	C18
Dalbavancin	Antibiotic	Diphenyl
Demoxepam	Benzodiazepines	C18
Desmethyldiazepam	Anxiolytic	C18
Dexamethasone	Ear infections	C18
Diamorphine	Opioid analgesic	Polar endcapped C18
Dianette	Alkaloid	C18
Diazepam	Anti anxiety	C18

# Applications

Compound	Use	Column
Diclofenac sodium	Painkiller	C18
Diethylaniline		C18
Digitoxin	Cardiac glycosides	C18
Dihydroquinidine	Antiarrhythmic	Diphenyl
Diltiazem	High blood pressure	Polar endcapped C18
Dimethylaniline		C18
Diphenhydramine	Antihistamine	C18
D-metamphetamine	Drugs of abuse	C18
DOPAC	Catecholamines	Polar endcapped C18
Dopamine	Catecholamine	HILIC
Doxazosin	Alpha blocker	Diphenyl
Entecavir	Antiviral	Diphenyl
Epinephrine	Catecholamine	HILIC
Epiyangambin	Sesquiterpene lactones	C18
Erythromycin	Erythromycin	HILIC
Estradiols	Estradiols	C18
Fenuron		C18
Flucloxacillin	Antibiotic	C18
Flunitrazepam	Anxiolytic	C18
Fluoruracil	Polars	HILIC
Fluoxetine	Antidepressant	C18
Folic acid	Vitamin	Polar endcapped C18
Fructose	Monosaccharide	Amino
Gabapentin	Epilepsy	C18
Gibberellin acid	Plant hormone	C18
Gliclazide	Diabetes	C18
GLU	Amino acids	C18
Glucose	Monosaccharide	Amino
GLY	Amino acids	C18
Guanosine	Nucleosides	HILIC
Haloperidol	Antipsychotic	C18
Heptylbenzene	Alkyl benzenes	C18
Hexylbenzene	Alkyl benzenes	C18
HIS	Amino acids	C18
Homogentisic acid		Polar endcapped C18
Hydroxy-21-acetate	Steroid	Cyano
Hydroxyphenylacetic acid		Polar endcapped C18
Hydroxyphenylpyruvic acid		Polar endcapped C18
Hydroxytisone-21-acetate	Steroid	Polar endcapped C18
Ibuprofen	Painkiller	C18
ILE	Amino acids	C18
Indol-3-yl-acetate	Plant hormone	C18

Compound	Use	Column
Irbesartan	Angiotensin II antagonist	C18
Isoascorbic acid	Vitamins	HILIC
Isonicotinamide	Positional isomers	Diphenyl
Ketopelenolide	Sesquiterpene lactones	C18
Kinetin	Plant hormone	C18
Lactose	Disaccharide	Amino
Lamotrigine	Epilepsy	C8
Lanalogol	Fragrance	C18
Lanandulyl acetate		C18
Lansoprazole	Stomach ulcers	C18
Lavandulol		C18
LEU	Amino acids	C18
Levocetirizine	Antihistamine	Polar endcapped C18
Lidocaine	Irregular heartbeats	C18
Limonen	Fragrance	C18
Linalyl acetate	Fragrance	C18
Lopinavir	HIV drugs	C18
Loratadine	Antihistamine	C18
Lorazepam	Anti anxiety	Diphenyl
LSD	Drugs of abuse	C18
Luteolin	Natural dyes	C18
LYS	Amino acids	C18
Maltose	Disaccharide	Amino
MCPA	Agrochemicals	C18
MCPB	Weed control	Cyano
MDA	Drugs of abuse	C18
MDEA	Drugs of abuse	C18
MDMA (Ecstasy)	Drugs of abuse	C18
Melamine		HILIC
MET	Amino acids	C18
Metanephrine	Catecholamine	HILIC
Methamphetamine	Drugs of abuse	C18
Methyl melonic acid	Organic acids	Polar endcapped C18
Methylbenzoate		C18
Midazolam	Anxiolytic	C18
Mirtazapine	Antidepressant	C18
Morphine	Drugs of abuse	C18
N,N-Dimethylaniline	QC test	C18
Naphthalene	QC test	C18
Nelfinavir	HIV drugs	C18
Neomycin sulphate	Ear Infections	C18
Nicotinamide	Positional isomers	Diphenyl
Nicotinic acid	Vitamins	HILIC
Nitrosinone		Polar endcapped C18



# Applications

Compound	Use	Column
Nitrazepam	Anxiolytic	C18
Nitrobenzene	Explosives	Cyano
Nordiazepam	Drugs of abuse	C18
Normetanephrine	Catecholamine	HILIC
Norpinephrine	Catecholamine	HILIC
Nortriptyline	Tricyclic antidepressants	C18
OH-Dalbavancin	Antibiotic	Diphenyl
Omeprazole	Stomach ulcers	C18
Oseltamivir	Antiviral	C18
Oxazepam	Hypnotic	C18
PAH	16 PAH EPA	C18
Paracetamol	Flu relief	C18
Paroxetine	Antidepressant	Polar endcapped C18
PCOC	Weed control	Cyano
Pentylbenzene	Alkyl benzenes	C18
Pesticides	KFDA 83 - 59 pesticides	C18
PHE	Amino acids	C18
Phenoxymethylpenicillin	Antibiotic	C18
Phenylephrine	Flu relief	C18
Pheophorbide		C18
Pheophytin		C18
PK11195	PET tracer	Diphenyl
PK11195 Dechlorinated	PET tracer	Diphenyl
Prednisolone	Steroid	Polar endcapped C18
Prednisone	Steroid	Polar endcapped C18
PRO	Amino acids	C18
Procaine	Anesthetic	C18
Prochlorperazine maleate	Phenothiazine antipsychotics	Diphenyl
Progesterone	Steroid	Polar endcapped C18
Proguanil	Anti-malarial	Diphenyl
Promethazine theoclate	Nausea	C18
Propylbenzene	Alkyl benzenes	C18
Protriptyline	Antidepressant	C18
Pyrazoline		C18
Pyridine		C18
Pyridoxine	Polars	HILIC
Pyropheophytin		C18
Quinidine	Antiarrhythmic	Diphenyl
Raloxifene glucuronides	Treat osteoporosis	C18
Riboflavin	Vitamins	HILIC
Ribose	Monosaccharide	Amino
Ritonavir	HIV drugs	C18

Compound	Use	Column
Rosuvastatin	Statins	C18
Sequinavir	HIV drugs	C18
SER	Amino acids	C18
Serotonin	Catecholamines	Polar endcapped C18
Sesartemin	Sesquiterpene lactones	C18
Simvastatin	High blood pressure	Polar endcapped C18
Sotalol	Beta blocker	C18
Succinic acid	Organic acids	Polar endcapped C18
Sucrose	Disaccharide	Amino
Sulfamerazine	Sulfa drugs	C18
Sulfamethoxazole	Sulfa drugs	C18
Sulfathiazole	Sulfa drugs	C18
Telmisartan	Hypertension	C8
Temazepam	Anti anxiety	C18
Tenofovir	HIV drugs	Polar endcapped C18
Terpinen 4 ol	Fragrance	C18
Terpineol	Plant hormone	C18
Testosterone	Hormone	C18
Theophylline	Alkaloid	C18
THR	Amino acids	C18
Thymidine (IS)	HIV drugs	Polar endcapped C18
Tiotropium bromide	Bronchodilator	C18
Toluene	Polars	HILIC
Tramadol	Opioid painkiller	C18
Trimipramine	Antidepressant	C18
TYR	Amino acids	C18
Tyrosine	Amino acids	Polar endcapped C18
Uracil	Nucleosides	HILIC
Uridine	Nucleosides	HILIC
VAL	Amino acids	C18
Valproate semisodium	Manic depression	C8
Verapamil	Irregular heartbeats	C18
Vitamin C	Vitamins	HILIC
Warfarin	Anticoagulant	Polar endcapped C18
Xylose	Monosaccharide	Amino
Zolpidem	Hypnotic	C18
Zopiclone	Hypnotic	C18

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