

ZirChrom Columns

- Excellent peak shapes for amines
- Unique selectivity
- Extreme chemical and thermal stability over silica or polymeric phases
- High efficiency

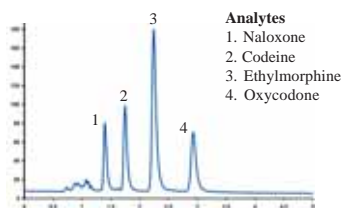
Porous Zirconia

Zirconia, or zirconium dioxide (ZrO₂), is a metal oxide that can exist in a number of crystalline and amorphous forms. The primary advantage of zirconia over either silica or polymeric stationary phases is its extreme chemical and thermal stability. Unlike silica, zirconia is completely stable over the entire pH range and at elevated column temperatures as high as 200° C. Unlike polymeric phases, zirconia does not shrink or swell as a function of mobile phase organic content or ionic strength, and it has very high mechanical strength. This extreme stability results in a column that may be cleaned under harsh conditions (acidic or basic), and also results in a much longer column lifetime. Long column life and stability translates to a reduced cost per analysis and a wider range of possible chromatographic conditions.

DiamondBond® Technology

DiamondBond columns contain truly bonded carbon phases – a first in chromatography. These unique materials were produced by ZirChrom in collaboration with Cabot Corporation. ZirChrom produces high performance carbon-coated zirconia particles. Cabot then uses a proprietary diazonium salt coupling reaction to attach organic groups directly to the surface of the carbon. This chemistry results in direct, covalent, carbon-carbon bonds to the surface. These bonds have incomparable high chemical and thermal stability. Chromatographic materials produced this way exhibit extremely low retention drift. They are also excellent choices for LC/MS applications due to their unrivaled ligand stability.

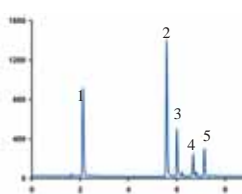
Separation of Opioids



Analytes
1. Naloxone
2. Codeine
3. Ethylmorphine
4. Oxycodone

LC Conditions
Mobile phase: 26.5/73.5 THF/20mM Ammonium phosphate, pH 11.0
Flow rate: 1.0mL/min
Temperature: 40° C
Inj. flow rate: 1.0µL
Detection: 220nm
Column: DiamondBond® C18, 100 x 4.6mm ID

Non-Steroidal Anti-Inflammatory Separation

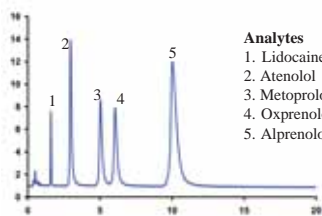


Analytes
1. Acetaminophen
2. Naproxen
3. Ketoprofen
4. Fenopfen
5. Indomethacin

LC Conditions
Mobile phase: A: Acetonitrile
B: 20mM ammonium acetate, pH 5.0
Inj. volume: 10µL
Flow rate: 1.0mL/min
Temperature: 35° C
Detection: 254nm
Column: Zirchrom® EZ
150 x 4.6mm ID

Time	% A	% B
0	10	90
10	90	10

Separation of Basic Drugs – Beta Blockers



Analytes
1. Lidocaine
2. Atenolol
3. Metoprolol
4. Oxprenolol
5. Alprenolol

LC Conditions
Mobile phase: 65/35 acetonitrile / 10mM ammonium acetate, pH 5.0
Inj. volume: 5µL
Flow rate: 1.0mL/min
Temperature: 35° C
Detection: 254nm
Column: Zirchrom® MS
50 x 4.6mm ID

New! ZirChrom Phases for LC/MS

ZirChrom®-EZ offers mass spec compatibility and unique selectivity on a zirconia platform. The deactivation of Lewis acid sites on the surface of the ZirChrom®-EZ particle allows the chromatography of Lewis base analytes using mobile phase additives of the user's choice including conventional LC/MS compatible buffers (such as acetate and formate) throughout the pH range of 1-10. Five non-steroidal anti-inflammatory drugs were separated using simple acetonitrile/water gradient elution and a LC/MS friendly acetate buffer.

ZirChrom®-MS uses the same type of Lewis acid deactivation chemistry as the ZirChrom-EZ column but with a covalent attachment for low bleed. ZirChrom-MS also has about 2.5 times as much retention for simple reversed-phase compounds than the ZirChrom-EZ column, which is beneficial for MS detection. Due to a mixed-mode separation mechanism, the ZirChrom-MS column offers unique selectivity for pharmaceutical method development.

ZirChrom®-EZ

Pore Size	Length (mm)	Cat. No.	
		2.1mm ID	4.6mm ID
3µm	50	EZ01-0521	EZ01-0546
	150	EZ01-1521	EZ01-1546
	250	EZ01-2521	EZ01-2546
5µm	50	EZ01-0521-5	EZ01-0546-5
	150	EZ01-1521-5	EZ01-1546-5
	250	EZ01-2521-5	EZ01-2546-5

ZirChrom®-MS

3µm	50	MS01-0521	MS01-0546
	150	MS01-1521	MS01-1546
	250	MS01-2521	MS01-2546
5µm	50	MS01-0521-5	MS01-0546-5
	150	MS01-1521-5	MS01-1546-5
	250	MS01-2521-5	MS01-2546-5

ZirChrom Reversed-Phases

- **DiamondBond® C18** – a C18 modified carbon phase with very different selectivity from ODS
- **ZirChrom® PBD** – great for general purposes and ideal for basic compounds, similar to ODS for non-electrolytes
- **ZirChrom® PS** – ideal for highly aqueous mobile phases, and alternative to ODS selectivity
- **ZirChrom® CARB** – ideal for diastereomers/geometric isomers, greatest difference in selectivity compared to ODS

DiamondBond®-C18 is made by covalently bonding C18 ligands to the surface of carbon-clad zirconia. This creates the first truly bonded carbon phases in the industry. Because the surface below the C18 ligands is carbon and not silica, DiamondBond-C18 has different selectivity from other phases. DiamondBond-C18 has better peak shapes than unmodified carbon phases, and unique selectivity compared to silica phases. Like all zirconia-based products, proper buffer selection helps to ensure the best peak shapes and band spacing for basic analytes. The carbon-carbon bonds attaching the ligands in DiamondBond phases are extremely resistant to cleavage which means it has low retention drift, no bleed, and can improve the sensitivity of LC/MS separations.

ZirChrom Reversed-Phases (Continued)

ZirChrom®-PBD is produced by coating ultra-stable zirconia particles with an equally stable extremely thin layer of crosslinked polybutadiene. The chemical selectivity of ZirChrom PBD columns is similar to that of a traditional C8 or C18 silica based column for non-ionic analytes. In the case of ionizable analytes, there are secondary interactions which can be used to fine tune the chromatographic selectivity (band spacing).

Consider using ZirChrom PBD with a phosphate buffer if either the tailing of amines or their selectivities are problematic on C18-and explore the full pH range (pH 1-14) to optimize your separation. For example, a 20 mM phosphate buffer will produce good peak shapes for many ionizable compounds.

ZirChrom®-PS uses an extremely thin layer of polystyrene, instead of the polybutadiene coating used in ZirChrom PBD. This gives ZirChrom PS an alternative selectivity and less retention, making it ideal for non-polar analytes, or where highly aqueous mobile phases are necessary.

ZirChrom®-CARB is a carbon clad zirconia. This support offers a unique retention mechanism that can be extremely retentive and selective. It is an excellent candidate for consideration when conventional reversed phase supports fail. ZirChrom-CARB is great for geometric isomer separations, and is superb for separating diastereomers. The column is an excellent choice for orthogonal screening in drug discovery and impurity profiling. Like all of our zirconia-based products, proper buffer selection helps to ensure the best peak shapes and band spacing.

DiamondBond®-C18

Pore Size	Length (mm)	Cat. No. 2.1mm ID	Cat. No. 4.6mm ID
3µm	50	DB01-0521	DB01-0546
	150	DB01-1521	DB01-1546
	250	DB01-2521	DB01-2546
5µm	50	DB01-0521-5	DB01-0546-5
	150	DB01-1521-5	DB01-1546-5
	250	DB01-2521-5	DB01-2546-5

ZirChrom®-PBD

3µm	50	ZR03-0521	ZR03-0546
	150	ZR03-1521	ZR03-1546
	250	ZR03-2521	ZR03-2546
5µm	50	ZR03-0521-5	ZR03-0546-5
	150	ZR03-1521-5	ZR03-1546-5
	250	ZR03-2521-5	ZR03-2546-5

ZirChrom®-PS

3µm	50	ZR09-0521	ZR09-0546
	150	ZR09-1521	ZR09-1546
	250	ZR09-2521	ZR09-2546
5µm	50	ZR09-0521-5	ZR09-0546-5
	150	ZR09-1521-5	ZR09-1546-5
	250	ZR09-2521-5	ZR09-2546-5

ZirChrom®-CARB

3µm	50	ZR01-0521	ZR01-0546
	150	ZR01-1521	ZR01-1546
	250	ZR01-2521	ZR01-2546
5µm	50	ZR01-0521-5	ZR01-0546-5
	150	ZR01-1521-5	ZR01-1546-5
	250	ZR01-2521-5	ZR01-2546-5

ZirChrom Ion Exchange Phases

- **ZirChrom®-SAX (pH 1-12, up to 80° C)**
 - Useful for inorganic and organic anions, separation of bio-molecules such as nucleotides, nucleosides, oligonucleotides, oligodeoxynucleotides, amino acids, and peptides
- **ZirChrom®-SHAX (pH 1-12, up to 80° C)**
 - All the advantages of SAX except that the surface is much more hydrophilic making it useful for anion-exchange of proteins
- **ZirChrom®-WAX (pH 3-9, up to 50° C)**
 - Useful for inorganic and organic anions, separation of bio-molecules such as nucleotides, nucleosides, oligonucleotides, oligodeoxynucleotides, amino acids, peptides and proteins
 - Normal phase separation of carbohydrates
- **ZirChrom®-WCX (pH 1-10, up to 50° C)**
 - Phosphate-coated zirconia for weak cation-exchange
 - Useful for protein chromatography in the cation-exchange mode
- **ZirChrom®-PEZ (pH 1-10, up to 50° C w/mobile phase additive)**
 - EDTPA-coated zirconia for cation-exchange
 - Useful for protein chromatography in the cation-exchange mode
 - Excellent phase for monoclonal antibody separations

ZirChrom®-SAX

Pore Size	Length (mm)	Cat. No. 2.1mm ID	Cat. No. 4.6mm ID
3µm	50	ZR06-0521	ZR06-0546
	150	ZR06-1521	ZR06-1546
	250	ZR06-2521	ZR06-2546
5µm	50	ZR06-0521-5	ZR06-0546-5
	150	ZR06-1521-5	ZR06-1546-5
	250	ZR06-2521-5	ZR06-2546-5

ZirChrom®-SHAX

3µm	50	ZR07-0521	ZR07-0546
	150	ZR07-1521	ZR07-1546
	250	ZR07-2521	ZR07-2546
5µm	50	ZR07-0521-5	ZR07-0546-5
	150	ZR07-1521-5	ZR07-1546-5
	250	ZR07-2521-5	ZR07-2546-5

ZirChrom®-WAX

3µm	50	ZR05-0521	ZR05-0546
	150	ZR05-1521	ZR05-1546
	250	ZR05-2521	ZR05-2546
5µm	50	ZR05-0521-5	ZR05-0546-5
	150	ZR05-1521-5	ZR05-1546-5
	250	ZR05-2521-5	ZR05-2546-5

ZirChrom®-WCX

3µm	50	ZR04-0521	ZR04-0546
	150	ZR04-1521	ZR04-1546
	250	ZR04-2521	ZR04-2546
5µm	50	ZR04-0521-5	ZR04-0546-5
	150	ZR04-1521-5	ZR04-1546-5
	250	ZR04-2521-5	ZR04-2546-5

ZirChrom®-PEZ

3µm	50	ZR08-0521	ZR08-0546
	150	ZR08-1521	ZR08-1546
	250	ZR08-2521	ZR08-2546
5µm	50	ZR08-0521-5	ZR08-0546-5
	150	ZR08-1521-5	ZR08-1546-5
	250	ZR08-2521-5	ZR08-2546-5