



ZirChrom®

# LC/MS Compatible Separation of Antidepressants on ZirChrom®-MS

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## Technical Bulletin # 296

The chromatography of basic drugs on C18-silica phases is often complicated due to mixed-mode interactions that cause poor peak shape and irreproducible results. ZirChrom®-MS is a new zirconia-based reversed-phase column that has enhanced mixed mode retention characteristics which allow for LC/MS chromatography of highly basic amines with excellent peak shape and efficiency.

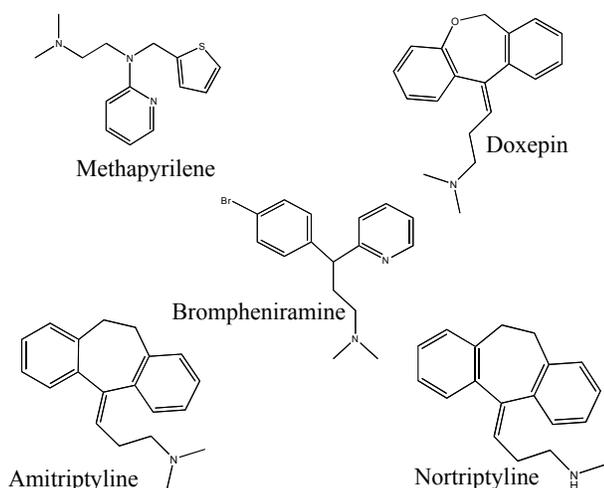


Figure 1: Structures for the Compounds of Interest.

### Introduction

The chromatography of basic drugs on C18-silica phases is difficult due to interactions between silanols and the amines<sup>1</sup>. We have found that a tricyclic antidepressant, Amitriptyline, may be used as a probe solute for quantifying silanophilicity of HPLC columns. The surface chemistry of zirconia-based phases is dominated by Lewis acid sites, rather than the Bronsted acid sites, which dominate the surface chemistry of silica phases. The mixed-mode retention character of ZirChrom®-MS (cation-exchange and reversed-phase) allows separations that were previously difficult using conventional silica C18 phases. This application note shows an impressive LC/MS compatible separation of antidepressants in a highly organic, near neutral pH mobile phase.

### Experimental

A mixture of five basic drugs (four antidepressants) was separated at 35 °C using a ZirChrom®-MS column. The separation conditions were as follows:

Column: ZirChrom®-MS, 50 mm x 4.6 mm i.d.  
(Part Number: MS01-0546)  
Mobile Phase: Isocratic elution: 65/35 A/B  
A: acetonitrile  
B: 10mM ammonium acetate, pH 5.0  
Temperature: 35 °C

Flow Rate: 1.0 ml/min.  
Injection Vol.: 1 µl  
Pressure Drop: 59 bar  
Detection: UV at 254 nm

Five basic pharmaceutical compounds were separated using simple acetonitrile/water isocratic elution and a LC/MS friendly acetate buffer. The selectivity and peak symmetry of all five compounds is very good which allows for a separation using only a short 5 cm long column.

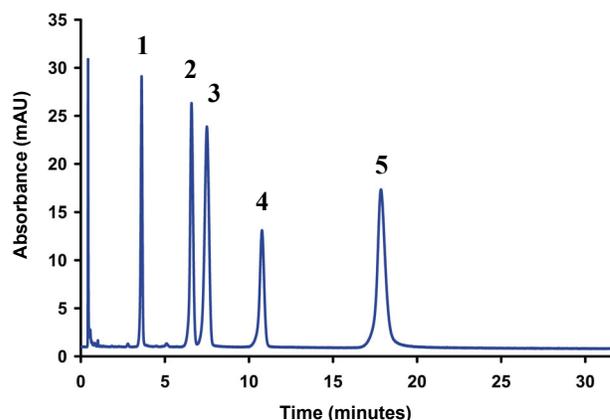


Figure 2: Separation of 1=Methapyrilene, 2=Doxepin, 3=Brompheniramine, 4=Amitriptyline, and 5=Nortriptyline.

This method can be tailored to your specific application needs. ZirChrom method developers can help to optimize and transfer this method to your site. Please contact ZirChrom technical support at 1-866-STABLE-1 or [support@zirchrom.com](mailto:support@zirchrom.com) for details.

ZirChrom phases offer unique selectivity, high efficiency, and excellent chemical and thermal stability.

### References

1) G.B. Cox, *J. Chromatography A*. **656**, 353, 1993.

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Visit [www.zirchrom.com](http://www.zirchrom.com) for more application notes using ultra-stable, high efficiency ZirChrom columns.



# Fast LC/MS Compatible Separation of Tricyclic Antidepressants

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## Technical Bulletin # 289

The chromatography of the tricyclic family of antidepressants on C18-silica phases has traditionally resulted in broad and tailed peaks in the neutral pH range where most silica phases are stable. ZirChrom®-EZ is a new zirconia-based reversed-phase column that has mixed mode retention characteristics which allow chromatography of these highly basic amines with excellent peak shape and efficiency.

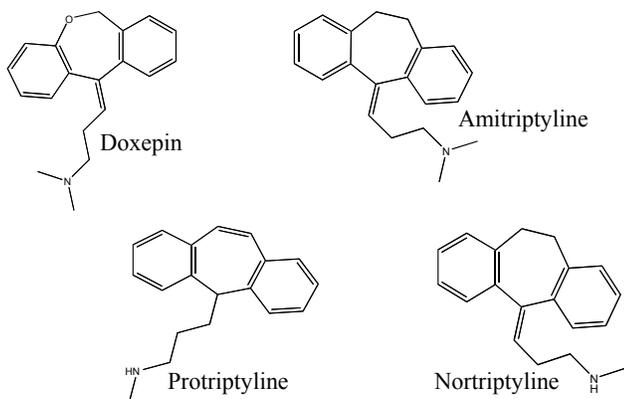


Figure 1: Structures of tricyclic antidepressants

### Introduction

The chromatography of the tricyclic antidepressants on C18-silica phases has traditionally been so problematic that amitriptyline is commonly used as a probe solute for quantifying silanophilicity of silica phases. The surface chemistry of zirconia-based phases is dominated by Lewis acid sites, rather than the Bronsted acid sites which dominate the surface chemistry of silica phases. The mixed-mode retention character of ZirChrom-EZ® (cation-exchange and reversed-phase) allows separations that were previously difficult using conventional silica C18 phases. This application note shows the exceptional separation of four tricyclic antidepressants in less than three minutes.

### Experimental

A mixture of four tricyclic antidepressants was separated at 35 °C using a ZirChrom®-EZ column. The separation conditions were as follows:

Column:	ZirChrom®-EZ, 50 mm x 4.6 mm i.d. (Part Number: EZ01-0546)
Mobile Phase:	Isocratic elution: 35/65 A/B A: 20mM ammonium acetate, pH 6.0 B: acetonitrile
Temperature:	35 °C with Metalox™ 200-C column heater

Flow Rate: 2.0 ml/min.  
Injection Vol.: 5 µl  
Pressure Drop: 110 bar  
Detection: UV at 254 nm

Four tricyclic antidepressant pharmaceuticals were separated using simple acetonitrile/water isocratic elution and a LC/MS friendly acetate buffer. The selectivity of all four compounds is excellent which allows for a very fast separation using only a short 5 cm column.

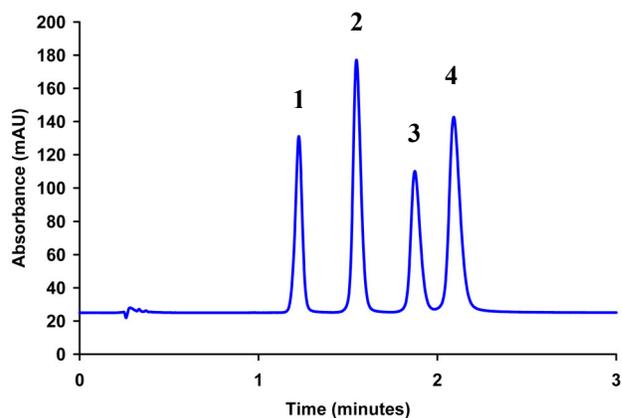


Figure 2: Separation of 1=Doxepin, 2=Protriptyline, 3=Amitriptyline, and 4=Nortriptyline

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ZirChrom phases offer unique selectivity, high efficiency, and excellent chemical and thermal stability.

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