

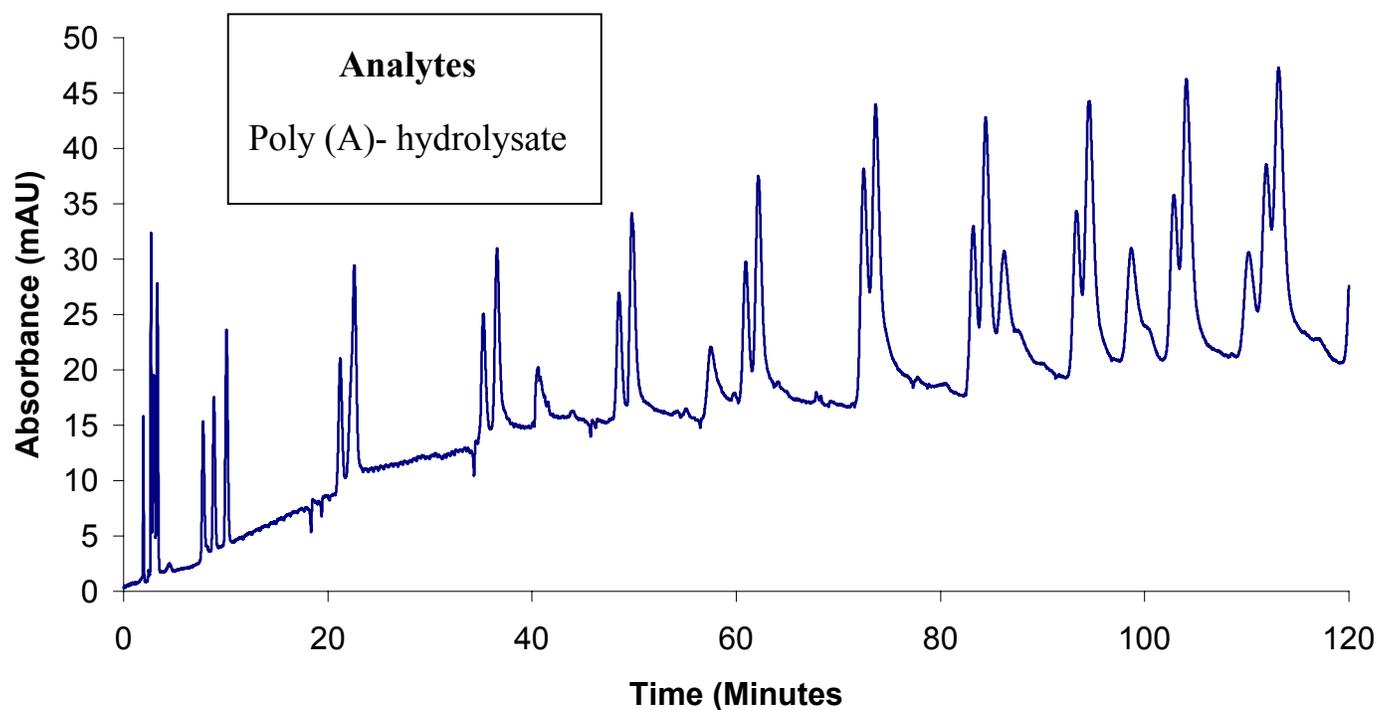
ZirChrom[®]

Technical Bulletin #166



... For Peak Performance

Oligonucleotide Separation on ZirChrom[®]-SAX



LC Conditions

Column: ZirChrom[®]-SAX, 50 mm x 4.6 mm i.d.

Mobile Phase:

A: 0.02 M potassium phosphate dibasic and
0.04 M NaCl at pH 8.5

B: 0.20 M potassium phosphate dibasic and
1.0 M NaCl at pH 8.5

Gradient: 5 to 95 % B over 90 minutes

Flow rate: 1.0 mL/min.

Temperature: 100 °C

Detection: 254 nm

Injection: 25 µl





High Performance Biomolecule Separations Using Zirconia-based Ion Exchange Phases

Technical Bulletin #267

Clayton V. McNeff, Peter W. Carr
ZirChrom Separations, Inc.

Silica and polymer-based phases used for the separation of biomolecules have traditionally suffered from such limitations as substrate instability in alkali media and shrinking/swelling of the particles upon changes in mobile phase composition. The extraordinary chemical and physical stability of zirconia-based phases allows much greater flexibility in method development for biomolecules. This note shows a separation of a polynucleotide hydrolysate using a ZirChrom[®]-SAX.

Introduction

The long-term reliability of an HPLC method depends greatly on the ruggedness of the stationary phase. In bonded silicas, an Si-O-Si bond is used to attach functional groups to the silica surface. It is well known that this bond is subject to chemical attack, especially at low pH. The silica itself dissolves readily in aqueous mobile phases at high pH. Even sophisticated silica bonding technologies have not solved this problem¹. The basic instability of bonded silicas causes retention drift, short column life, and frequent replacement of the column and re-qualification of the HPLC system. This is expensive both in terms of actual expenditures and in terms of lost productivity.

Zirconia-based Phases for Ion Exchange Chromatography

Porous zirconia coated with polyethyleneimine (PEI) has been shown to be very useful for the separation of nucleosides, nucleotides, oligonucleotides, oligodeoxynucleotides and proteins². The PEI coating can be crosslinked with a hydrophobic crosslinker and subsequently quaternarized to produce the stationary phase known as ZirChrom[®]-SAX which exhibits a mixed-mode characteristic of both reversed-phase and ion-exchange retention mechanisms. Because of the mixed-mode characteristic of the phase, temperature can be used as an effective tool in method development to selectively moderate the contributions of the ion-exchange and reversed-phase retention mechanisms to the overall retention.

References

- (1) J. J. Kirkland et. al., Anal. Chem. 61, 2-11 (1989).
- (2) C. McNeff et al., Anal Chem. 67, 2350-2353 (1995).

ZirChrom Separations, Inc.
617 Pierce Street, Anoka, MN 55303
1-866-STABLE-1
support@zirchrom.com

Experimental

A hydrolyzed sample of Poly-G (oligonucleotide) was separated at elevated temperature using a ZirChrom[®]-SAX column. The separation conditions were as follows:

Column: 4.6 mm x 50 mm ZirChrom[®]-SAX
Mobile Phase: Gradient elution from 5-95% B
A: 0.02 M potassium phosphate dibasic and 0.04 M NaCl, pH 8.5
B: 0.20 M potassium phosphate dibasic and 1.0 M NaCl @ pH 8.5
Temperature: 100 °C
Injection Vol.: 25 µl
Flow rate: 1.0 ml/min.
Detection: UV at 254 nm

Results

The chromatogram below illustrates the capability of a zirconia-based ion-exchange phase to resolve nucleotide oligomers in a hydrolysate of poly-G. The separation is performed in a phosphate buffer at 100 °C, further demonstrating the extraordinary chemical stability of the stationary phase.

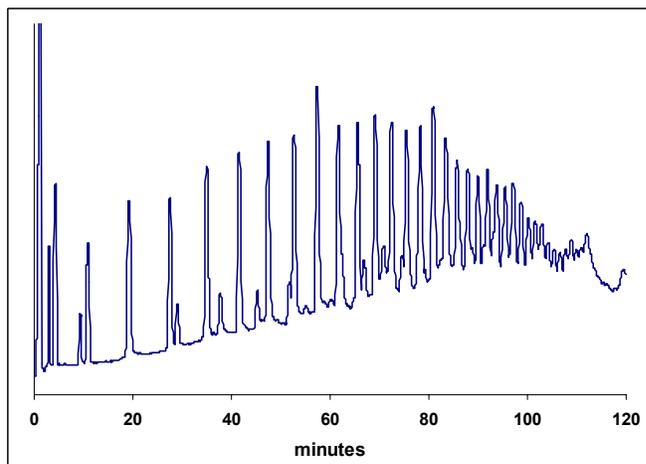


Figure 1: Separation Poly-G Hydrolysate

Visit www.zirchrom.com for more application notes using ultra-stable, high efficiency DiamondBond columns from ZirChrom.