

## Analyze Acids, Bases, and Zwitterions, Using a SUPELCO<sup>SM</sup> SUPELCOSIL LC-ABZ HPLC Column

The SUPELCOSIL LC-ABZ HPLC column was specially developed for analyses of acids, bases, and zwitterions. A unique surface deactivation process eliminates silanol-sample interaction, enabling you to analyze a wide variety of compounds without mobile phase modifications or additives. We used a SUPELCOSIL LC-ABZ column to analyze a basic compound, codeine, and to separate acidic compounds: sorbic, benzoic, ascorbic, fumaric, and citric acids. This phase also has a polar-nonpolar selectivity different from that of conventional reversed phases, providing an opportunity for unique separations. (ChromFax No.: 394024)

### Key Words:

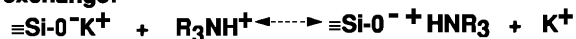
acids • bases • zwitterions • codeine  
organic acids • deactivated HPLC phases

Silica-based packings have proven invaluable for use in a wide variety of HPLC analyses, including many pharmaceutical and food applications. However, acidic, basic, and zwitterionic compounds can interact differently with residual silanol groups on the silica base, causing problems such as peak asymmetry, retention time drift, and irreproducible separations (Figure A).

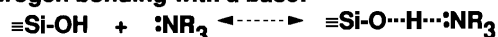
Using a unique surface deactivation technology, we developed SUPELCOSIL<sup>SM</sup> LC-ABZ columns specifically for analyzing acids, bases, and zwitterions. Through electrostatic shielding, a polar group embedded in the reversed phase prevents interaction of acids or bases with silanol groups on the silica base. Consequently, the column ensures effective analyses of acidic or basic compounds, polar, neutral, or nonpolar compounds, or mixtures of such analytes. A SUPELCOSIL LC-ABZ column is an excellent choice for separating basic pharmaceutical and other compounds because it will provide good peak shape at neutral pH and low ionic strength – without amine modifiers or other ion suppression techniques.

### Figure A. Silanol Interactions in Reversed Phase HPLC

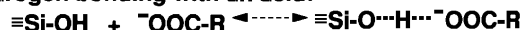
#### Ion exchange:



#### Hydrogen bonding with a base:



#### Hydrogen bonding with an acid:

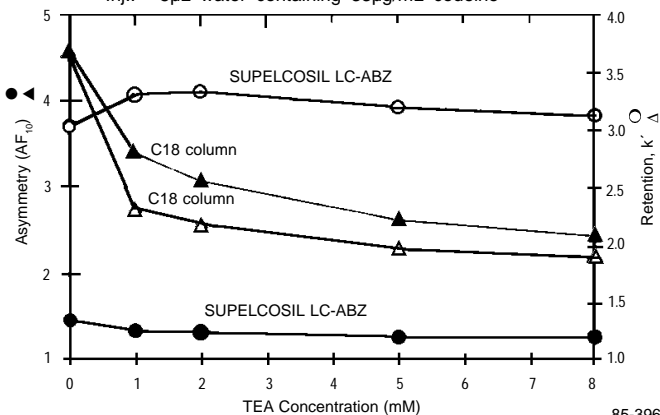


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To show the unique abilities of a SUPELCOSIL LC-ABZ column, we compared retention and peak symmetry for a basic compound, codeine, on SUPELCOSIL LC-ABZ and SUPELCOSIL LC-18 columns (Figure B). At near neutral pH, where silanols and codeine are fully interactive, the codeine peak was symmetrical on the SUPELCOSIL LC-ABZ column, at all triethylamine (TEA) concentrations used, and retention time was constant. Although the peak shape from the SUPELCOSIL LC-18 column improved as the TEA concentration was increased, it never attained the symmetry shown on the SUPELCOSIL LC-ABZ column. The retention time decreased as the increasing TEA concentration reduced the effect of silanol-analyte interaction.

### Figure B. Consistent Retention and Excellent Peak Shape for Codeine, Independent of TEA Concentration

Columns: 15cm x 4.6mm, 5µm particles (with 0.5µm in-line frit filter)  
Cat. No.: 59140-U  
Mobile Phase: acetonitrile:25mM KPI, 0–8mM triethylamine (pH 6.7), 25:75  
Flow Rate: 2mL/min  
Det.: UV, 210nm  
Inj.: 5µL water containing 33µg/mL codeine



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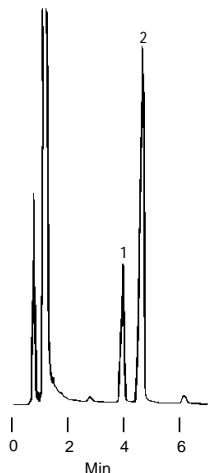
SUPELCOSIL LC-ABZ columns also effectively separate acidic compounds. Organic acids in a grape-flavored freezer bar were poorly resolved on a SUPELCOSIL LC-18 column, but were effectively resolved by a SUPELCOSIL LC-ABZ column (Figure C). Analyses on a SUPELCOSIL LC-ABZ column showed the ascorbic acid concentration in orange-flavored carbonated beverage decreased and fumaric acid concentration increased after the beverage was allowed to stand for six hours at room temperature (Figure D).

SUPELCOSIL LC-ABZ columns are effective for analyzing a broad spectrum of acidic, basic, and polar compounds, without mobile phase modifications or additives. If you are using a conventional reversed phase column to contend with analyses of a difficult analyte, we recommend you try a SUPELCOSIL LC-ABZ column.

## Figure C. Sorbic and Benzoic Acids in Freezer Bar

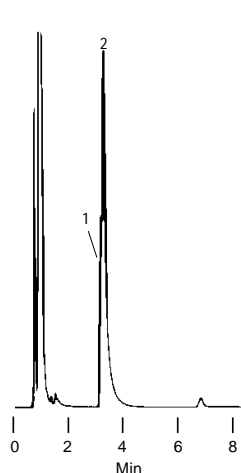
Columns: **15cm x 4.6mm, 5µm particles** (with 0.5µm in-line frit filter)  
 Cat. No.: **59140-U**  
 Mobile Phase: acetonitrile:25mM KPI (pH 2.0), 25:75  
 Flow Rate: 2mL/min  
 Det.: UV, 210nm  
 Inj.: 5µL filtered, undiluted grape-flavored freezer bar

### SUPELCO SIL LC-ABZ Column



1. Sorbic acid  
 2. Benzoic acid

### SUPELCO SIL LC-18 Column

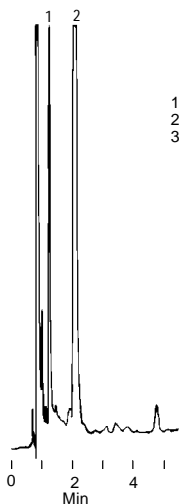


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## Figure D. Organic Acids in Carbonated Beverage

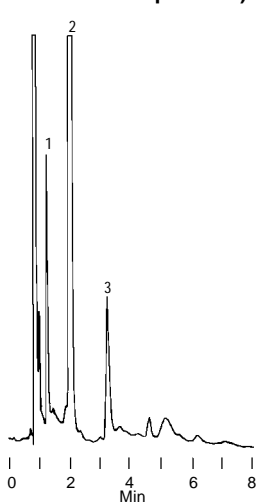
Column: **SUPELCO SIL LC-ABZ, 15cm x 4.6mm, 5µm particles** (with 0.5µm in-line frit filter)  
 Cat. No.: **59140-U**  
 Mobile Phase: 25mM KPI (pH 2.0)  
 Flow Rate: 2mL/min  
 Det.: UV, 210nm  
 Inj.: 5µL filtered, undiluted orange-flavored carbonated beverage

### Fresh Beverage (refrigerated)



1. Ascorbic acid  
 2. Citric acid  
 3. Fumaric acid

### Degraded Beverage (6 hr at room temperature)



## Ordering Information:

### SUPELCO SIL LC-ABZ Columns

5µm packing, 100Å pores

5cm x 4.6mm

59141

15cm x 4.6mm

59140-U

25cm x 4.6mm

59142

25cm x 10mm

59170

### Supelguard™ LC-ABZ Guard Column Kit

2cm x 4.6mm cartridge-type column, column holder, hardware for connecting to 1/16" tubing

59544-U

### Supelguard LC-ABZ Guard Columns

pk. of 2

59545

### SUPELCO SIL LC-ABZ Cartridge Columns

5µm packing, 100Å pores

15cm x 4.6mm, column only

55141

25cm x 4.6mm, column only

55145

Column End Fittings, pk. of 2

55200-U

### Cartridge Column Starter Kits

Cartridge column and hardware, plus nuts and ferrules to connect the column to 1/16" tubing.

Starter Kit, 15cm x 4.6mm column

55140

Starter Kit, 25cm x 4.6mm column

55144

### Cartridge Guard Columns

Supelguard LC-ABZ Columns, 2cm x 4.6mm, pk. of 2

59545-U

Supelguard Cartridge Column Holder

55205

Contact our Technical Service Department

(phone 800-359-3041 or 814-359-3041, FAX 814-359-5468)

for expert answers to your questions.

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