SUPELCO®
Solutions within.™

SLB® IL (i-series) Capillary GC Columns

Selectivity and Inertness

Improved Inertness

Selectivity Options

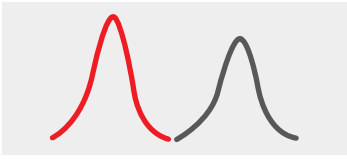
Applications

The improved inertness for polar analytes was the inspiration for the development of SLB®-IL (i-series) ionic liquid capillary GC columns. They solve a dilemma that has existed for a long time; is it better to optimize for selectivity or inertness? With i-series columns, GC users can enjoy selectivity and inertness!

Selectivity and Inertness

SLB-IL (i-series) Columns

High selectivity for polar analytes.
High inertness towards polar analytes.



2 analytes with similar boiling points

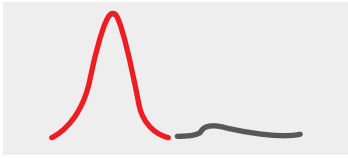
Resolution and good peak shape for both analytes.

Non-polar analyte Polar analyte

Selectivity or Inertness

Traditional Highly Polar Columns

High selectivity for polar analytes.
Low inertness towards polar analytes.



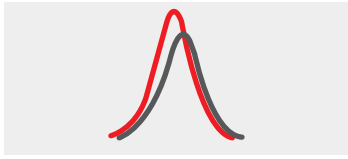
2 analytes with similar boiling points

Resolution, but poor peak shape for the polar analyte.

Non-polar analyte Polar analyte

Traditional Non-polar Columns

Low selectivity for polar analytes.
High inertness towards polar analytes.



2 analytes with similar boiling points

Good peak shape for both analytes, but limited resolution.

Non-polar analyte Polar analyte

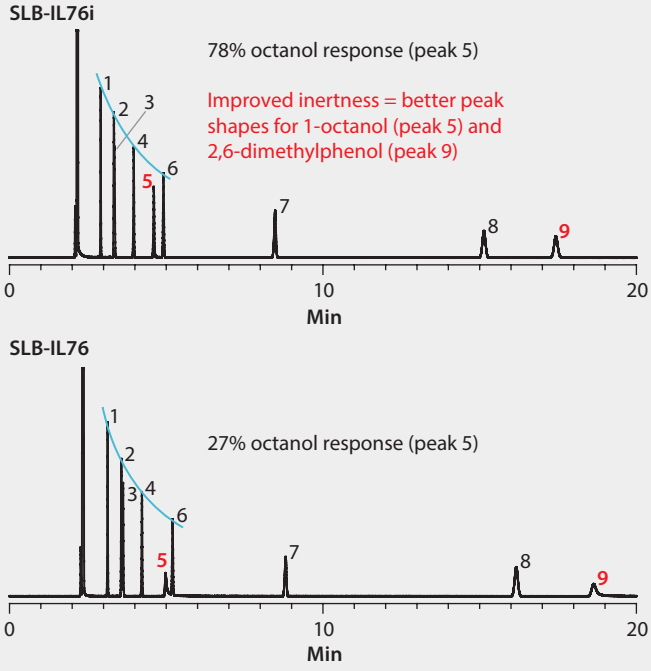
Improved Inertness

Using the polar column test mix for the quality control of polar and highly polar columns allows an assessment of inertness. For example, the % response of 1-octanol (its peak height relative to a curved line connecting the n-alkane markers) can be measured. A greater value indicates a more inert column.

Figure 1. Polar Test Mix

column: SLB-IL76i, 30 m × 0.25 mm I.D., 0.20 µm
column: SLB-IL76, 30 m × 0.25 mm I.D., 0.20 µm (28913-U)
oven: 130 °C
inj. temp.: 250 °C
detector: FID, 250 °C
carrier gas: helium, 1.2 mL/min (28 cm/sec)
injection: 1 µL, 100:1 split
liner: 4 mm I.D., split type, cup design
sample: polar column test mix (47302), 9 analytes, each at 500 µg/mL in methylene chloride

1. *n*-Pentadecane
2. *n*-Hexadecane
3. 2-Octanone
4. *n*-Heptadecane
5. 1-Octanol
6. *n*-Octadecane
7. *n*-Eicosane
8. 2,6-Dimethylaniline
9. 2,6-Dimethylphenol

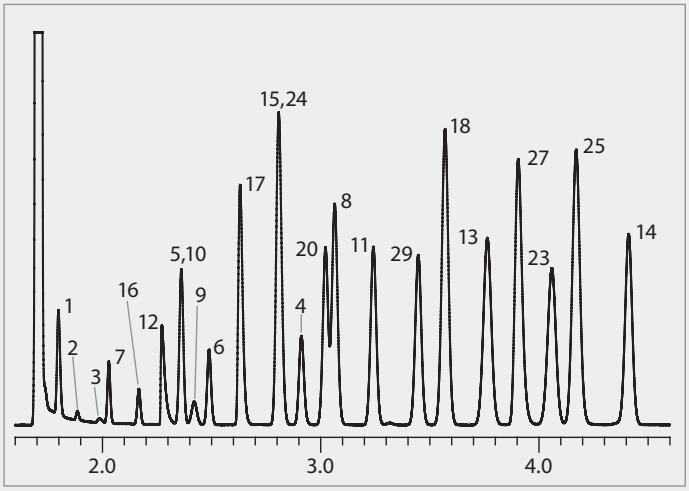


Industrial Solvents

SLB-IL (i-series) columns offer selectivity options with inertness for applications involving complex mixtures comprised of compounds with varying functionality.

Figure 2. Industrial Solvents on SLB-IL60i

column: SLB-IL60i, 30 m × 0.25 mm I.D., 0.20 µm (29832-U)
oven: 40 °C (4 min), 8 °C/min to 200 °C (5 min)
inj. temp.: 250 °C
detector: FID, 250 °C
carrier gas: helium, 30 cm/sec
injection: 1 µL, 100:1 split
liner: 4 mm I.D., split type, cup design
sample: industrial solvents, each at 0.2 % (v/v) in pentane



1. Hexane
2. 1,1-Dichloroethylene
3. Methyl formate
4. Acetone
5. Ethyl formate
6. Methyl acetate
7. trans-1,2-Dichloroethylene
8. Tetrahydrofuran
9. Carbon tetrachloride
10. 1,1-Dichloroethane
11. Ethyl acetate
12. Methanol
13. Isopropyl acetate
14. 2-Butanone
15. 2-Propanol
16. Methylene chloride
17. Ethanol
18. Benzene
19. *n*-Propyl acetate
20. Trichloroethylene
21. 4-Methyl-2-pentanone
22. Isobutyl acetate
23. Tetrachloroethene
24. Chloroform
25. sec-Butanol
26. Toluene
27. *n*-Propanol
28. 1,4-Dioxane
29. 1,2-Dichloroethane
30. *n*-Butyl acetate
31. 2-Hexanone
32. Isobutanol
33. Nitropropane
34. Isoamyl acetate
35. Ethylbenzene
36. Mesityl oxide
37. *p*-Xylene
38. *m*-Xylene
39. 5-Methyl-2-hexanone
40. *n*-Butanol
41. *n*-Amyl acetate
42. *o*-Xylene
43. Isoamyl alcohol
44. Chlorobenzene
45. Styrene
46. 1,1,1,2-Tetrachloroethane
47. Dimethylformamide
48. Diacetone alcohol
49. Cyclohexanol
50. 2-Butoxyethanol (Butyl cellosolve)
51. 1,4-Dichlorobenzene
52. 1,1,2,2-Tetrachloroethane
53. 2-Methylphenol
54. 3-Methylphenol
55. 4-Methylphenol

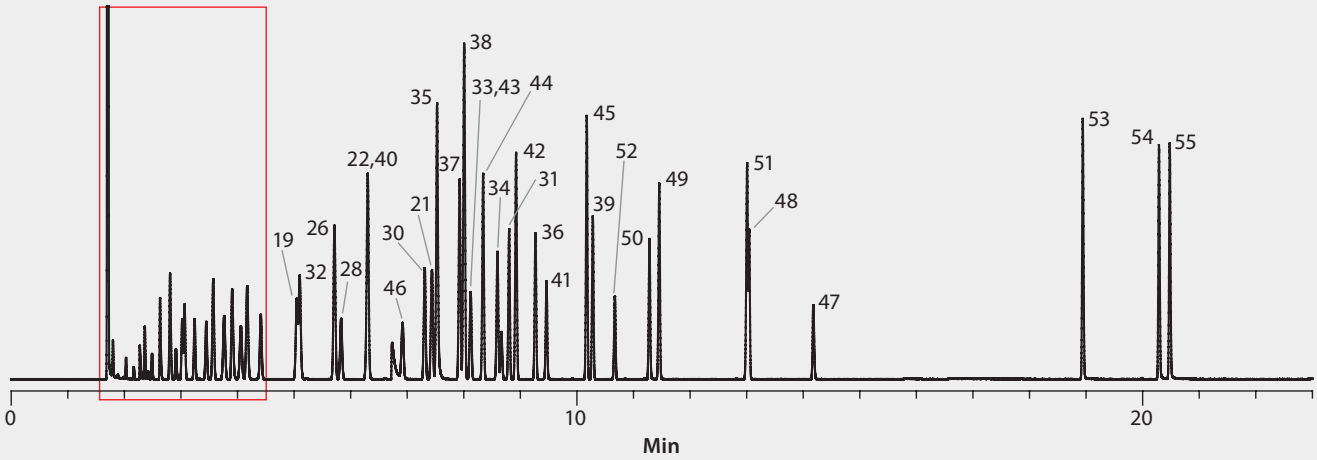
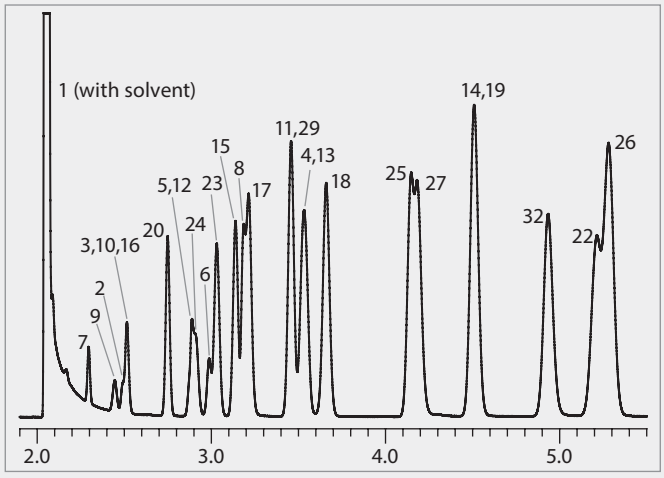


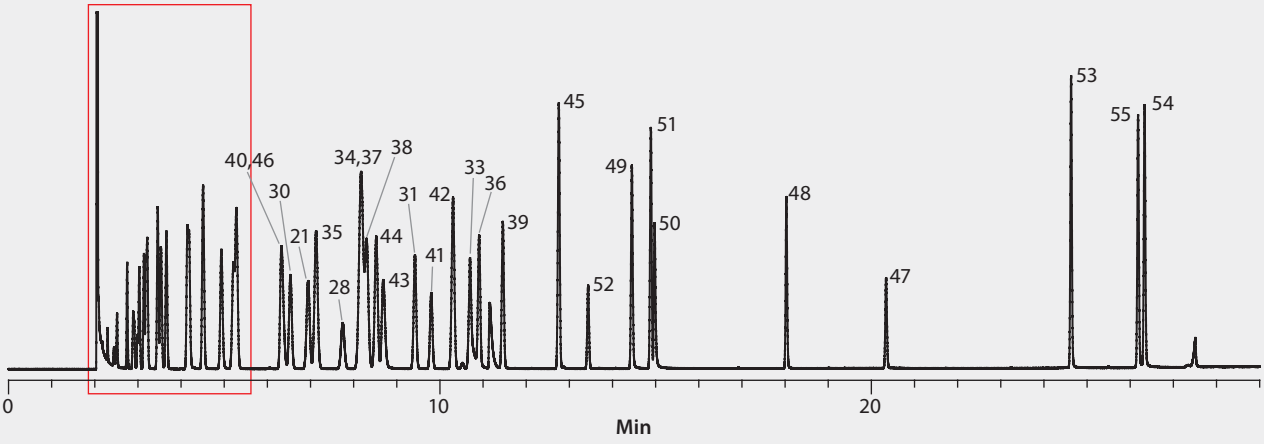
Figure 3. Industrial Solvents on SLB-IL111i

column: SLB-IL111i, 30 m × 0.25 mm I.D., 0.20 µm (29883-U)

oven: 40 °C (8 min), 8 °C/min to 200 °C (1 min)

All other conditions and peak IDs are the same as **Figure 2**.





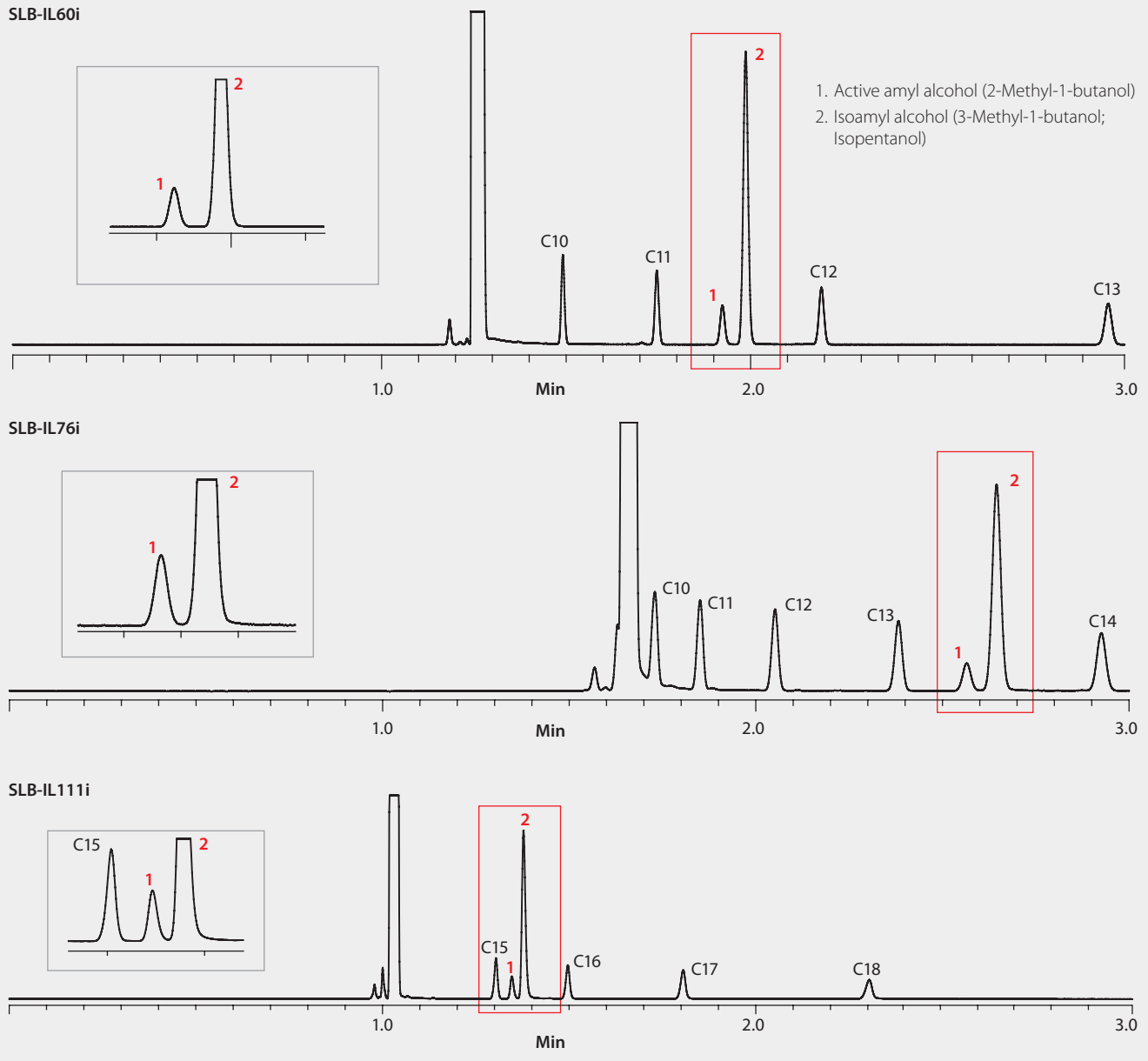
Selectivity Options

It is advantageous to have columns with alternative selectivities at hand, because resolution is greatly affected by selectivity. A range of i-series columns were developed and classified as polar (SLB-IL60i), highly polar (SLB-IL76i), and extremely polar (SLB-IL111i). **Table 1** contains complete specifications for all three chemistries.

Two by-products of the fermentation process are active amyl alcohol and isoamyl alcohol. Alcoholic beverage manufacturers are interested in these analytes due to their contribution to the aroma characteristic. The inclusion of n-alkane markers allows some of the selectivity characteristic of each chemistry to be exposed.

Figure 4. Resolution of Active Amyl Alcohol and Isoamyl Alcohol

column: SLB-IL60i, 30 m× 0.25 mm I.D., 0.20 µm (29832-U)
column: SLB-IL76i, 30 m × 0.25 mm I.D., 0.20 µm
column: SLB-IL111i, 30 m × 0.25 mm I.D., 0.20 µm (29883-U)
oven: 90 °C
inj. temp.: 250 °C
detector: FID, 250 °C
carrier gas: hydrogen, 40 cm/sec
injection: 1 µL, 100:1 split
liner: 4 mm I.D., split type, cup design
sample: active amyl alcohol, isoamyl alcohol, and n-alkane markers in methylene chloride



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SLB-IL (i-series) capillary GC columns are more inert versions of popular ionic liquid chemistries, which provide both selectivity and inertness towards polar analytes, resulting in better accuracy and sensitivity.

Table 1. SLB-IL (i-series) Column Specifications

SLB-IL60i

Application: The selectivity of SLB-IL60i is more polar than PEG/wax phases, resulting in unique elution patterns. It has a higher maximum temperature than most PEG/wax columns (280 °C compared to 260-270 °C). Excellent alternative to existing PEG/wax columns. Also a good GCxGC column choice.
USP Code: None
Phase: Non-bonded; 1,12-Di(tripropylphosphonium)dodecane bis(trifluoromethanesulfonyl)imide
Temp. Limits: 35 °C to 280 °C (isothermal or programmed)

SLB-IL76i

Application: The SLB-IL76i phase structure is engineered with numerous interaction mechanisms, resulting in selectivity differences even when compared to columns with similar GC column polarity scale values. Also a good GCxGC column choice.
USP Code: None
Phase: Non-bonded; Tri(tripropylphosphoniumhexanamido)triethylamine bis(trifluoromethanesulfonyl)imide
Temp. Limits: subambient to 270 °C (isothermal or programmed)

SLB-IL111i

Application: The selectivity of SLB-IL111i is most orthogonal to non-polar and intermediate polar phases, resulting in very unique elution patterns. Maximum temperature of 270 °C is very impressive for such an extremely polar column. Great choice for separation of polarizable analytes (contain double and/or triple C-C bonds) from neutral analytes. Also a good GCxGC column choice.
USP Code: None
Phase: Non-bonded; 1,5-Di(2,3-dimethylimidazolium)pentane bis(trifluoromethanesulfonyl)imide
Temp. Limits: 50 °C to 260 °C (isothermal or programmed)

Did you know . . .

GC stationary phases based on dicationic and polycationic ionic liquids were invented by Prof. Daniel W. Armstrong, currently at the University of Texas at Arlington (USA).

Ordering Information

Description	Cat. No.
SLB®-IL60i Capillary GC Columns	
20 m × 0.18 mm I.D., 0.14 µm	29829-U
30 m × 0.25 mm I.D., 0.20 µm	29832-U
60 m × 0.25 mm I.D., 0.20 µm	29833-U
30 m × 0.32 mm I.D., 0.26 µm	29836-U
60 m × 0.32 mm I.D., 0.26 µm	29837-U
SLB®-IL76i Capillary GC Columns	
30 m × 0.25 mm I.D., 0.20 µm	inquire
SLB®-IL111i Capillary GC Columns	
30 m × 0.25 mm I.D., 0.20 µm	29883-U
60 m × 0.25 mm I.D., 0.20 µm	29884-U

Related Information

Additional chromatograms, product information, real-time availability, and ordering information is available 24 hours a day at
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Order/Customer Service: sigma-aldrich.com/order
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3050 Spruce St.
St. Louis, MO 63103
(314) 771-5765
sigma-aldrich.com

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