



Supelco SLB®-IL60 Ionic Liquid GC Columns

Better High Temperature Stability

Benefits of higher temperature when performing GC include decreased analysis times, elevated bake-out to remove large non-target compounds, and analysis of additional higher boiling compounds. The SLB-IL60 column is stable to 300 °C for both programmed and isothermal use. This is 20-40 °C higher than the programmed limits, and 20-50 °C higher than the isothermal limits, of traditional polyethylene glycol (PEG) columns. The PEG 5 column referenced below incorporates a non-traditional PEG phase.

To illustrate the superior stability of the SLB-IL60 column, it was compared directly to five popular commercially available PEG columns, each from a different manufacturer. All columns were 30 m x 0.25 mm I.D., 0.25 µm dimensions, except the SLB-IL60 column, which has a 0.20 µm film thickness. The maximum temperature limits for all columns tested are included in **Figure 2**. Complete specifications of SLB-IL60 columns are shown in **Table 1**.

Table 1. SLB-IL60 Column Specifications

- Application: The SLB-IL60 polar ionic liquid column has a polarity/selectivity similar to that of polyethylene glycol (PEG) columns (usually have 'wax' in the product name), but different enough to provide a unique elution pattern. It also has a higher maximum temperature of 300 °C, compared to 250-280 °C for most PEG columns. These features make it an excellent alternative to existing 'wax' columns. The combination of a high thermal limit and an orthogonal selectivity to non-polar columns also makes it a good GCxGC column choice. Launched in 2012.
- USP Code: None
- Phase: Non-bonded; proprietary
- Temp. Limits: 35 °C to 300 °C (isothermal or programmed)

Thermal Stress Test

Each column was subjected to an abbreviated thermal stress test, which was developed to determine high temperature (300 °C) stability. During this test, columns were subjected to a total of 15 high-temperature runs (oven programmed from 50 °C to 300 °C with a 20 minute hold). Over the duration of the test, each column was exposed to 300 °C for a total of 300 minutes.

FID Bleed

The observed FID bleed levels from the 1st '300 °C' and the 15th '300 °C' run for all columns are displayed in Figure 1. All five PEG columns produced similar FID bleed levels, with the PEG 4 and PEG 2 columns ranking as the best overall performing PEG columns for this

test. As shown, the SLB-IL60 column performed significantly better for this performance indicator than any PEG column. Most impressive is the bleed level actually decreased for the SLB-IL60 column, even after exposed to 300 °C for 300 minutes.

FID bleed levels from each column operated to its programmed temperature limit were measured before and after thermal stress. This data is displayed in **Figure 2** and shows that exposing any of the PEG columns to 300 °C for as short as 300 minutes triggers increased FID bleed, even when the column is subsequently operated within its programmed temperature limit. Better high temperature stability is exhibited by the SLB-IL60 column, in that it maintains a lower FID bleed level before, during, and after this thermal stress.

Selectivity

Before and after the thermal stress test described above, a 9-component polar column test mix was analyzed on each column. All five PEG columns produced almost identical chromatography, with the PEG 3 column performing slightly better than the other PEG columns. **Figure 3** shows chromatograms obtained from the PEG 3 and SLB-IL60 columns. The elution order of 2,6-dimethylaniline and 2,6-dimethylphenol (peaks 7 and 8) is reversed on the SLB-IL60 column compared to the PEG columns.

Comparing the before and after chromatograms reveals a selectivity change on all PEG columns, most notably the decrease in the relative retention of 2,6-dimethylaniline (peak 7) and 2,6-dimethylphenol (peak 8), and the increase in the relative retention of *n*-eicosane (peak 9). This indicates the PEG columns became less polar, and therefore less selective for polar analytes, and more selective for non-polar analytes. Conversely, minimal change in selectivity was observed for the SLB-IL60 column. This indicates the SLB-IL60 column can be exposed to 300 °C without changing its phase chemistry or altering its relative amounts of possible analyte-phase interactions.

Conclusion

PEG columns cannot be exposed to a 300 °C oven temperature, even for brief periods, without adversely affecting chromatographic performance, based on indicators such as FID bleed and selectivity. The SLB-IL60 column is similar in selectivity to PEG columns. Because it can be used to 300 °C without degradation of chromatographic performance, it can expand the use of a polar column for applications that PEG columns cannot perform.

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Figure 1. FID Bleed Levels (pA) During Thermal Stress Test

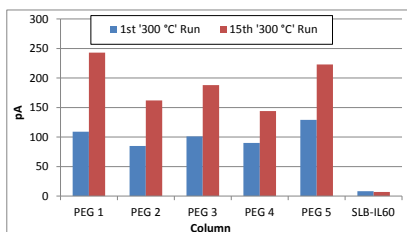


Figure 2. FID Bleed Levels (pA) Before/After Thermal Stress Test

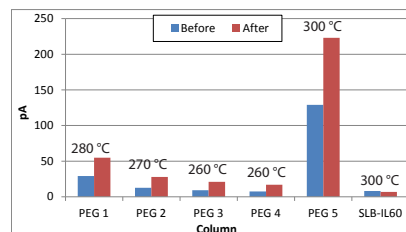
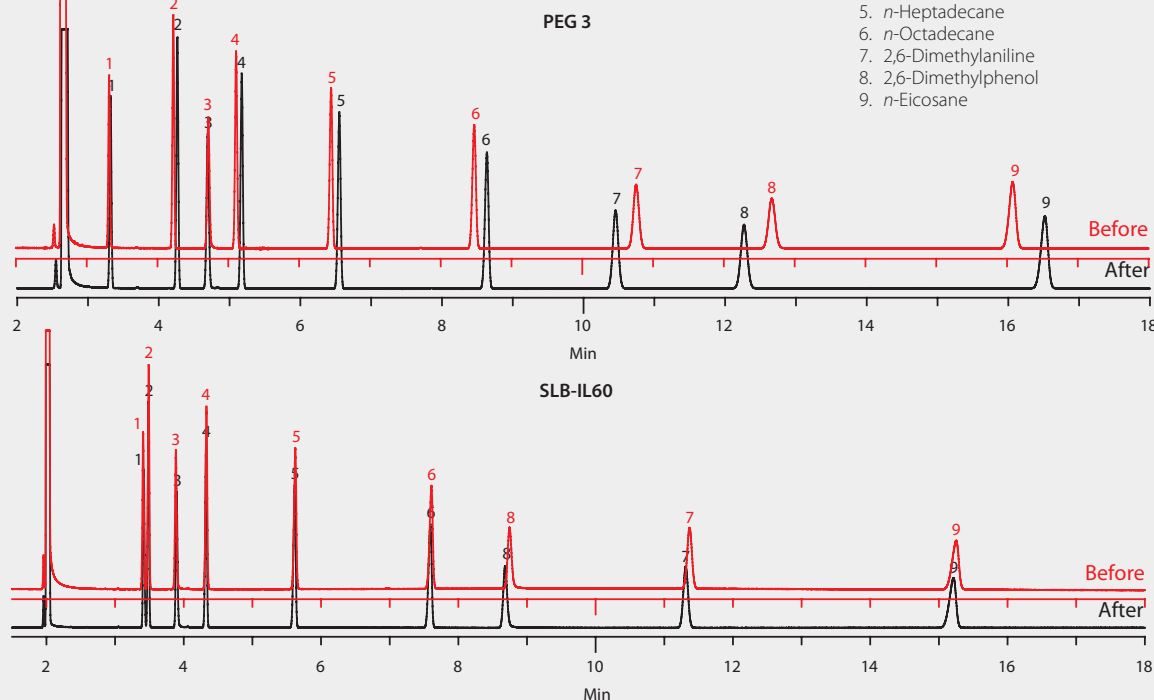


Figure 3. Selectivity Before/After Thermal Stress Test

column 1: PEG 3, 30 m x 0.25 mm I.D., 0.25 μ m
 column 2: SLB-IL60, 30 m x 0.25 mm I.D., 0.20 μ m (29505-U)
 oven: 155 °C (25 min) for PEG 3; 130 °C (25 min) for SLB-IL60
 inj. temp.: 250 °C
 carrier gas: helium, 20 cm/sec for PEG 3; helium, 25 cm/sec for SLB-IL60
 detector: FID, 250 °C
 injection: 1 μ L, 100:1 split
 liner: 4 mm I.D., split/splitless type, single taper wool packed FocusLiner™ design
 sample: polar column test mix (47302), 9 analytes, each at 500 μ g/mL in methylene chloride

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



Featured Products

Description	Cat. No.
SLB-IL60, 15 m x 0.10 mm I.D., 0.08 μ m	29503-U*
SLB-IL60, 30 m x 0.25 mm I.D., 0.20 μ m	29505-U
SLB-IL60, 60 m x 0.25 mm I.D., 0.20 μ m	29506-U*
SLB-IL60, 30 m x 0.32 mm I.D., 0.26 μ m	29508-U*
SLB-IL60, 60 m x 0.32 mm I.D., 0.26 μ m	29509-U*

*Products will be available soon.

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