

unique selectivity: The power of ionic liquid capillary columns for essential oil analysis

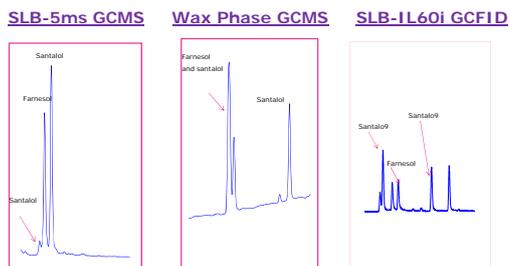
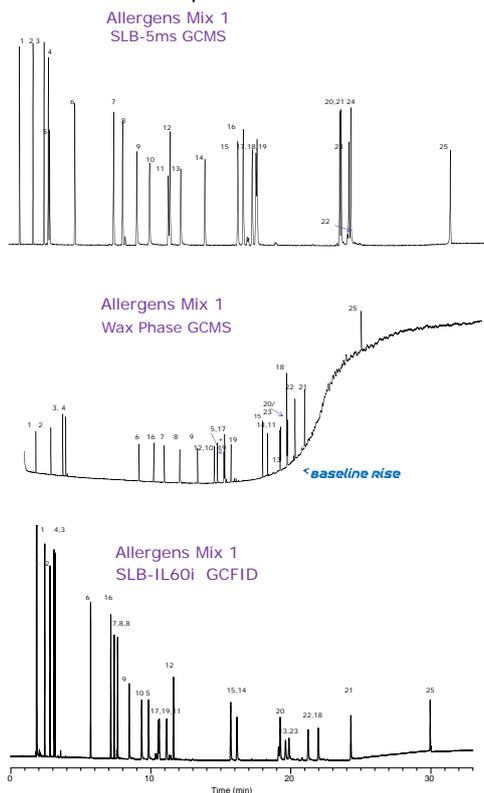
MERCK

Len Sidisky, Kathy Kiefer, Jamie Desorcie, and Greg Baney
MilliporeSigma, 595 North Harrison Road, Bellefonte, PA, USA

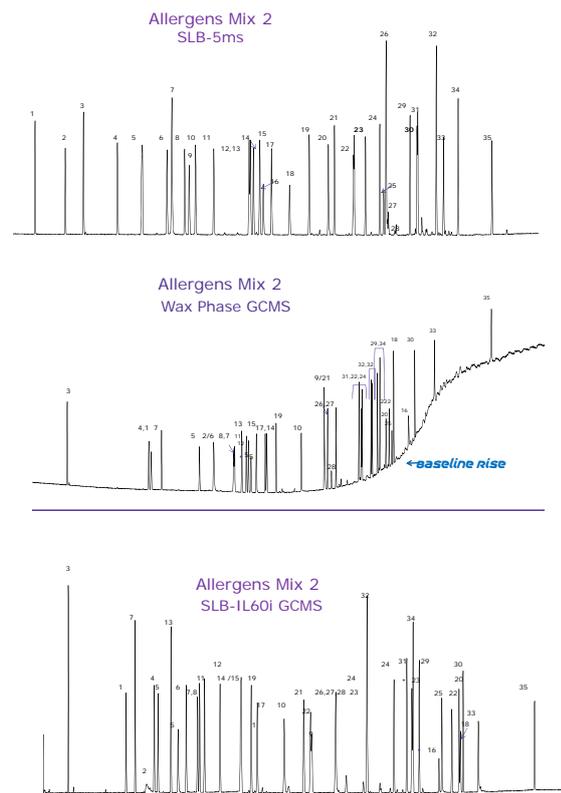
Abstract

Flavor and fragrance (essential oils) analyses represent some of the most challenging chromatographic separations, due to the complexity of the various samples. Essential oils are composed of a wide variety of chemical compounds such as terpenes, ketones, aldehydes, alcohols, esters and other hydrocarbons. The complexity of these samples necessitates the use of capillary gas chromatography in order to provide adequate resolution of key compounds in the samples. The best way to improve the resolution of essential oil samples is to choose a capillary column with a unique selectivity. Traditionally, columns based on polysiloxane or polyethylene glycol chemistries have been the columns of choice for these analyses. Over the years, extensive evaluations of columns manufactured with ionic liquid stationary phases have occurred. Their main strength was discovered to be unique selectivity. These columns have the ability to perform many of the same applications as columns made with polysiloxane polymer or polyethylene glycol stationary phases of similar polarity, but with slight elution order changes. Many times this results in increased resolution and/or shorter run times. We have been able to demonstrate very unique separations of key flavor isomers such as farnesol and santalol that can only be achieved on the ionic liquid columns as two examples. This paper will compare and contrast the selectivity of the ionic liquids stationary phases with traditional phases of similar or like selectivity's for applications with a variety of different essential oil samples.

Farnesol and Santalol Separation Different Stationary Phases



Unique Separation of Allergen Mix 2 on Different Stationary Phases



Elution Order

1. Benzaldehyde
2. Salicylaldehyde
3. Terpinolene
4. Camphor
5. Methyl salicylate/Methyl-2-octynoate (Folione)
6. Nerol
7. Carvone/Linalyl acetate
8. Geraniol
9. Cinnamaldehyde
10. Hydroxycitronellal
11. DMBCA acetate
12. Damascene Isomer
13. Geranyl acetate
14. Beta Damascenone
15. Damascene Isomer
16. Vanillin
17. Damascene Isomer
18. Coumarin
19. alpha Isomethyl ionone
20. Isoeugenyl acetate
21. Lilial
22. 3-Propylidene phthalate/Amyl salicylate
23. Eugenyl acetate
24. Amylcinnamaldehyde alpha
25. Lyral (Major and Minor)
26. ISO E Super
27. ISO E Super
28. ISO E Super
29. Hexylcinnamaldehyde alpha
30. Benzyl benzoate
31. Vertofix
32. Galaxolide 1 and 2
33. Benzyl salicylate
34. Hexadecanolactone
35. Benzylcinnamate

Summary

The differences in selectivity between a nonpolar SLB-5ms and the polyethylene glycol phase and the SLB-IL60i ionic liquid phase are shown. The SLB-IL60i provides unique separations the 5% phenyl and Wax phase can not achieve. The SLB-IL60i very little GC-MS background compared to a Wax column.