COMPARISON OF CYANO AND WAX PHASES FOR THE ANALYSIS OF FATTY ACID METHYL ESTERS (FAMEs)

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INTRODUCTION

Fatty acids are natural components of many food substances. The importance of identifying the composition of fatty acids in many of the foodstuffs has increased from both an economic and health point of view. Research has shown that many of the saturated fatty acids in edible oils are detrimental to our health and maybe a contributing factor to the increased rate of heart disease within the population.

Also important is the need for quality control of these foodstuffs. It is important that the supplier/manufacturer accurately states the composition of the foodstuff as this can affect the value of the finished products.

THE ANALYSIS

The fatty acids normally contained in foodstuffs are analyzed as the fatty acid methyl ester (FAME). Analysing the fatty acids as the methyl ester is an easier and more reproducible method of analysis than analysing the free fatty acids.

Analyses of FAME samples are usually performed on specifically designed columns such as the SGE BPX70 capillary column. BPX70 is a high polarity polysiloxane phase with a high proportion of cyanopropyl groups incorporated into the siloxane backbone. The BPX70 column is ideal for separation of saturated and unsaturated FAME mixtures. Difficult-to-separate isomers such as C18:1n9c (Oleic) (compound 18) and C18:1n9t (Elaidic) (compound 19) (**Figure 1**) are easily separated on the BPX70 column.

SolGel-WAX™, a high temperature polyethylene glycol phase, is an alternative column that can be used for the analysis of FAME samples. A high polarity column, the SolGel-WAX capillary column, is capable of separating a wide range of FAME compounds with similar elution orders to that of the BPX70 **(Figure 2**).

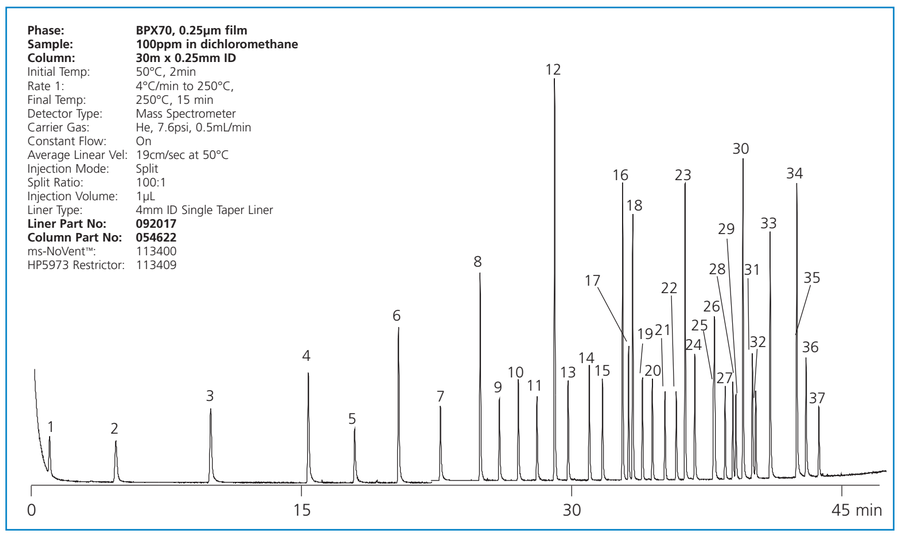

Figure 1.

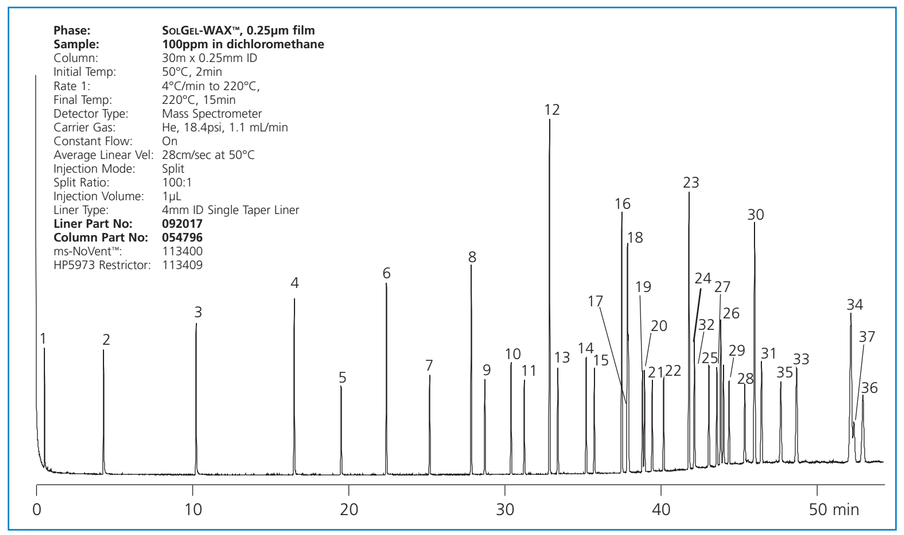

Figure 2.

Components

1. C4:0 (Butyric)
2. C6:0 (Caproic)
3. C8:0 (Caprylic)
4. C10:0 (Capric)
5. C11:0 (Undecanoic)
6. C11:0 (Undecanoic)
7. C12:0 (Lauric)
8. C13:0 (Tridecanoic)
9. C14:0 (Myristic)
10. C14:1 (Myristoleic)
11. C15:0 (Pentadecanoic)
12. C15:1 (*cis*-10-Heptadecenoic)
13. C16:0 (Palmitic)
14. C16:1 (Palmitoleic)
15. C17:0 (Heptadecanoic)
16. C17:1 (*cis*-10-Heptadecenoic)
17. C18:0 (Stearic)
18. C18:1n9 (Elaidic) (t)
19. C18:1n9 (Oleic) (c)
20. C18:2n6 (Linolelaidic) (t)
21. C18:2n6 (linoleic) (c)
22. C18:3n6 (*g*-Linolenic)
23. C18:3n3 (*a*-Linolenic)
24. C20:0 (Arachidic)
25. C20:1n9 (*cis*-11-Eicosenoic)
26. C21:0 (Henicosanoic)
27. C20:3n6 (*cis*-8,11,14-Eicosatrienoic)
28. C20:4n6 (Arachidonic)
29. C20:3n3 (*cis*-11,14,17-Eicosatrienoic)
30. C22:0 (Behenic)
31. C22:1n9 (Erucic)
32. C20:5n3 (*cis*-5,8,11,14,17-Eicosapentaenoic)
33. C23:0 (Tricosanoic)
34. C24:0 (Lignoceric)
35. C22:2 (*cis*-13,16-Docosadienoic)
36. C24:1n9 (Nervonic)
37. C22:6n3 (*cis*-4,7,10,13,16,19-Docosahexaenoic)

ADVANTAGES AND DISADVANTAGES

The advantages of using the specifically designed BPX70 column over the wax column include excellent selectivity and separation of the difficult-to-separate isomers and faster run times. The BPX70 column can separate C18:1 cis and trans isomers along with a variety of other complex isomers. The separation of FAME compounds on the BPX70 column is unique and faster than on wax-type columns. The chromatograms in **Figure 1** and **Figure 2** show the elution of a complex mix on BPX70 and SolGel-WAX respectively. The BPX70 column elutes the 37 components in less than 44 minutes, while the SolGel-WAX column elutes the same mixture in less than 54 minutes.

The SolGel-WAX capillary column is a high temperature wax column with a maximum temperature of 280/300°C. The high thermal stability and inert, robust nature of the SolGel-WAX capillary column is due to a unique bonding process during production. The SolGel-WAX column has a higher thermal stability than the BPX70 column, which can be useful in the event of high boiling components contaminating the column. The contaminants are more easily baked out of the SolGel-WAX column than that of the BPX70 column.

CONCLUSION

The first choice capillary column for the analysis of complex FAME samples is the BPX70 cyanopropyl phase capillary column. The BPX70 has greater selectivity of complex FAME isomers and gives faster elution times than the polyethylene glycol phases. However, the use of the general purpose SolGel-WAX column for the analysis of FAME samples is an excellent alternative to the BPX70 FAME column. The SolGel-WAX column gives good separation of most FAME mixtures, and it is thermally stable, inert and robust.

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