

Approaches to the Analysis of Saturated and Mono-unsaturated FAME using Highly Polar GC Phases

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Highly polar GC phases are useful for the analysis of polyunsaturated FAME because they exhibit an affinity for unsaturation which may be harnessed for the selective separation of positional isomers and for speciation on the basis of number of double bonds. In general, such phases are less effective for the resolution of mono- and di-unsaturated FAME and, for mechanistic reasons, lose specificity for double bond positions with decreasing levels of unsaturation. Very highly polar phases are also poor solvents for longer chain saturated and mono-unsaturated FAME and are therefore prone to class specific overloading.

In this study, FAME components were separated using four capillary columns of identical dimensions but containing different phases (BPX5, BP20, BPX70, and BPX90, 30m x 0.25mm i.d., 0.25 micron film thickness) operated under identical conditions. Retention times were determined for compounds on each column and correlations were sought between paired data. Peak symmetry was assessed as a measure of resistance to overloading for analytes of similar chain length but differing degrees of unsaturation.

Further derivatization of the methyl esters was undertaken to introduce an unsaturated moiety that could function as a common anchor point for the various FAME. The increase in analyte unsaturation is discussed in terms of its normalising influence on analyte solubility in the highly polar phase and also as primary binding point from which to measure saturated carbon number to the first point of unsaturation in the carbon chain. This new approach to analysis is examined mechanistically for its influence over isomer resolution for C18:1 FA isomers and as a tool for extending the utility of very polar GC phases.