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PP31. High efficiency microfabricated planar columns for analysis of real-world samples of essential oils and plant volatile fraction

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Compact and miniaturized instrumentation has obvious benefits in terms of energy consumption, materials, and laboratory space and, at the same time offers the possibility of "in-field" applications. In view of a possible application of on-chip GC for the analyses of essential oils in-situ with the industrial production and the volatile fraction emitted from plants, this study evaluates the performance of a set of planar columns developed to analyze complex mixtures. In a previous study, the performances of 2-m planar columns statically coated with apolar (Sil5%-PH), polar (FFAP-EXT), and chiral (Et-β-CD) stationary phases were tested. The results were comparable to those of reference conventional NB columns, efficiency achieving a number of theoretical plates per meter (N/m) ranging from 5700 for Et-β-CD to 7200 for Sil5%-PH [1]. Plant and food volatile fractions are characterized by high complexity and usually consist of components within a widely extended range of volatility and polarity. A reliable chemical analysis, therefore, requires columns with a high separation power. One of the ways to deal with this issue successfully is to increase column length while keeping high efficiency and selectivity. A set of 5-m planar columns (60 x 80 µm; nominal d_c 0.71 µm) coated with the same stationary phases as in the previous study was therefore developed. Column performances were tested by analyzing essential oils (peppermint, lavender, chamomile, rosemary, tea tree, and bergamot) and headspace of the same aromatic plants, as well as standard mixtures of related compounds. The results were compared to those obtained with the 2-m planar columns of the previous study taken as reference. The 5-m planar columns provide separations of the components of the investigated samples fully overlapping on the corresponding conventional NB column. Their chromatographic performances were highly satisfactory achieving efficiency higher than the previous ones with N/m reaching 9300 for the FFAP-EXT planar column, and significantly increasing the retention of highly volatile compounds, thereby providing a drastic increase of their separation power (i.e. peak capacity). These results show that 5-m planar columns can provide performances that make them able to satisfy all requirements for a reliable analysis of complex samples such as essential oils and plant volatile fractions.

References:
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