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Conventional and enantioselective GC with micro-fabricated planar columns for analysis of real-world samples of plant volatile fraction

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Compact instrumentation, offering technical characteristics and performance comparable to those of conventional setups, has obvious benefits in terms of saving energy, materials, and laboratory space and affords the possibility of “in-field” applications.
In view of a possible application of on-chip GC for the in-situ analyses of the volatile fraction emitted from plants, this study evaluates the performance of a set of planar columns of different geometry installed in a conventional GC unit. The essential oils and the headspace samples of a group of medicinal and aromatic plants as well as standard mixtures of related compounds were analyzed with planar columns and the results were compared to those obtained with reference equivalent narrow-bore (NB) columns (l: 5m, d_c: 0.1 mm, d_f: 0.1 µm). Planar columns were statically coated with the stationary phases (SP) commonly adopted to analyze the plant volatile fraction: dimethyl polysiloxane 5 % phenyl and acid-treated polyethylene glycol as apolar and polar SPs for conventional GC and a 30% 6$^{I\text{-}VII}$-*O*-TBDMS-3$^{I\text{-}VII}$-*O*-ethyl-2$^{I\text{-}VII}$-*O*-ethyl-β-cyclodextrin in PS-086 as chiral SP for enantioselective GC.
The tested planar columns showed performances close to the reference conventional NB columns, with theoretical plate numbers per meter (N/m) ranging from 6100 to 7200 for those coated with the conventional SP, and above 5600 for those with the chiral selector. They provide separations of the components of the investigated samples that perfectly overlaps that of the conventional NB column for both conventional and enantioselective GC. The chromatographic performances of conventional and planar columns were highly comparable, in both qualitative (I^T_S varying by a maximum of 7 units) and quantitative (RSD on the area percent and absolute concentrations below 10%) terms. These results show that all aspects required to characterize a plant volatile fraction (i.e. peak identification and quantitation, and chiral recognition) may be covered.