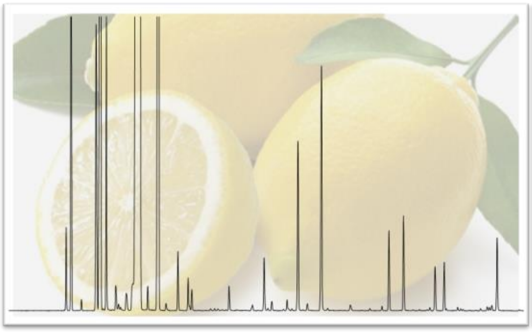
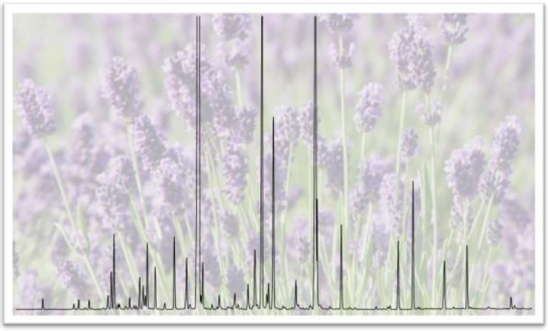



Quantitative Analysis of Essential Oils – Science, Technology and Methods

Essential Oils are the complex mixture of chemical compounds produced by living organism and isolated by means of physical methods from a whole plant or plant part of know taxonomic origin. The composition of essential oils is mainly represented by monoterpene and sesquiterpene hydrocarbons, and their oxygenated derivatives as well as aliphatic aldehydes, alcohols, and esters.

SHIMADZU
Excellence in Science

Instrumentations

Shimadzu is pursuing leading-edge science and technologies in analytical and measuring instruments including chromatographs and mass spectrometry

www.shimadzu.eu

MERCK

Consumables

Merck Life Science is a leading supplier to the global Life Science industry with solutions and services for research, biotechnology development

www.sigmaaldrich.com

Chromaleont

Analytical Methods

Chromaleont offers solutions for the development of analytical instruments and software for chemical analysis in the field of Separation Science

www.chromaleont.it

SHIMADZU
Excellence in Science

Shimadzu - Instrumentation

Gas chromatography (GC) is an analytical technique able to separate components of mixtures for obtaining information about their compositions. The information obtained from a chromatographic analysis can include a chromatogram (a graphical image of a detector output), information regarding the heights and the areas of the resolved peaks in a chromatogram, their quantity, etc. The flame ionization detector (FID) is the detector of choice in GC analysis for quantitative purposes. The FID is a destructive mass-sensitive detector, and its response is proportional to the mass of carbon atoms that pass through it in unit time.

LabSolutions

NEXIS GC-2030

Considering GC analyses using flame ionization (FID), which do not provide structural information of the analysed molecules, relative retention data (more precisely, linear retention index) are used as the primary criterion for peak assignment. The FID gives unit response for most hydrocarbons. This allows you to quantify components in mixtures without having calibration standards for every component. Amounts of components in a sample will be proportional to their peak areas. So, a simple area percent report will closely reflect the mass percent of each component in a mixture.

With Shimadzu LabSolutions GC analytical management software, you can operate data measurement and analysis, create and export reports of the analysed essential oils.

P/N	Name	Remarks
221-85702-58	GC-2030 AF, 230V	GC-2030 Equipped with Split / Splitless Injector and AFC as well as Flame Ionisation Detector with APC
221-77063-41	Tool kit for GC-2030	-
221-86002-58	AOC-30i Autoinjector sampler model	Auto injector AOC-30i for GC-2030; for 2-line setup with two columns
221-86005-58	AOC-30i Mounting Parts	Mandatory for installation of AOC-30i auto injector on GC-2030; for 2-column setup
227-37036-01	Shimadzu Gas Filter Kit for GC-FID/FPD	Includes one 3-position base plate with M type connectors, one Oxygen/Moisture/ Hydrocarbon filter for Carrier gas, two Hydrocarbon/Moisture filters for H2 and Air.
223-62704-92	LabSolutions LCGC Workstation Ver. 5.x	-
961-10020-25	1.5 ml Screw vial, clear (100 pcs)	-
961-10030-25	Non-magnetic screw cap for 1.5 mL vials (100 pcs)	-
221-34618	10 µL Syringe, for AOC-20i/20s	-
227-35004-01	Premium Green Injector Septa (50 pcs)	-
227-35007-01	Deactivated Liner with Wool for Split (5 pcs)	-
980-25670	Standard for FID and BID specification and IQOQ	n-C12,14,16 /n-heptane solution 100ng/uL (1x1mL ampule)

The list only contains the most important items, for the detailed one please contact Shimadzu.

For information about Shimadzu, please visit the Web site at:
www.shimadzu.eu

Supelco® Analytical Products

MERCK

Merck - Consumables

The selection of the capillary GC column in an essential oil analysis is of great importance for the characterization of the matrix. In general, conventional GC analysis of an essential oil is carried out on 30 m column, with 0.25 mm of internal diameter and 0.25 µm of stationary phase film thickness, coated with a poly(5% diphenyl – 95 % dimethyl siloxanes) phase (SLB®-5ms # 28471-U). The separation is based on different boiling-point of analytes. Considering that essential oil components such as terpene and oxygenated derivatives frequently present similar boiling-points, the analytical method must be accurately optimized.

Another crucial aspect regards the dilution in solvent (type of solvent and dilution ratio). Merck offers you a comprehensive portfolio of solvents in order to provide the right solution for your specific application. All solvents of Merck are designed to fit your essential oil analyses and are available in a variety of sizes, packaging materials, and with the supporting documentation you need.

Merck portfolio includes also analytical standards (e.g., C_7-C_{30} saturated alkanes for linear retention index calculation), analytical syringes (e.g., Hamilton) to ensure accurate solvent dilution, Supelco® analytical vials available in a variety of colour, sizes, volume capacity and material composition. All vials are inert and free of extractables or leachables to prevent affecting results, and compatible with Shimadzu GC instrumentation.

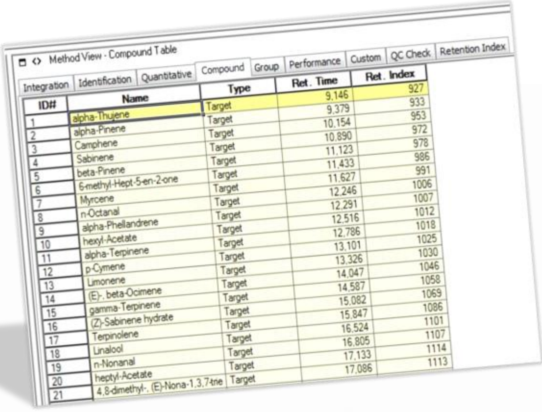
P/N	Name	Remarks
28471-U	SLB®-5ms Capillary GC Column	Silphenylene polymer virtually equivalent in polarity to poly(5% diphenyl/95% dimethyl siloxane) phase
28046-U	Equity™-1 Capillary GC Column	Poly(dimethyl siloxane) phase
24079	SUPELCOWAX™ 10 Capillary GC Column	Poly(ethylene glycol) phase
29505-U	SLB®-IL60 Capillary GC Column	1,12-Di(tripropylphosphonium)dodecane bis(trifluoromethanesulfonyl)imide phase
139386	Hexane	ReagentPlus®, ≥99%
H2198	Heptane	ReagentPlus®, 99%
34850-M	Acetone	Suitable for HPLC, ≥99.8%
49452-U	C7-C40 Saturated Alkanes Standard	Certified reference material, 1000 µg/mL each component in hexane
49451-U	C7-C30 Saturated Alkanes Standard	Certified reference material, 1000 µg/mL each component in hexane
49453-U	C4-C24 Even Carbon Saturated FAMEs	1000 µg/mL each component in hexane, analytical standard
49454-U	C4-C24 Even Carbon Saturated FAEEs	Certified reference material, 1000 µg/mL each component in hexane
57342-U	SPME fiber assembly Polydimethylsiloxane (PDMS)	d_f 100 µm(PDMS), for use with manual holder, needle size 23 ga
57326-U	SPME Fiber Assembly Polydimethylsiloxane/Divinylbenzene (PDMS/DVB)	d_f 65 µm(PDMS/DVB), for use with manual holder, needle size 24 ga,
57334-U	SPME fiber assembly Carboxen/Polydimethylsiloxane (CAR/PDMS)	d_f 85 µm (CAR/PDMS), for use with manual holder, needle size 24 ga
57328-U	SPME fiber assembly Divinylbenzene/Carboxen/Polydimethylsiloxane (DVB/CAR/PDMS)	d_f 30 µm (CAR/PDMS layer) and d_f 50 µm (DVB layer), needle size 24 ga

For information about Merck, please visit the Web site at:
www.sigmaaldrich.com

The life science business of Merck operates as MilliporeSigma in the U.S. and Canada.

Chromaleont - Analytical Methods

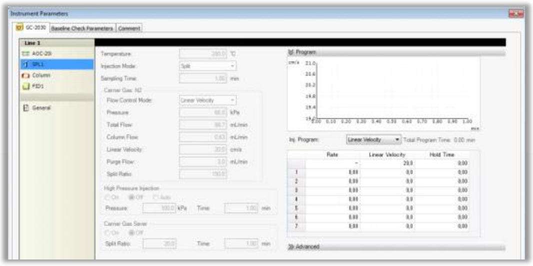
GC method development often requires the evaluation and optimization of several parameters such as flow rate, choice of the carrier gas, temperature of injection and detection, temperature program, run time, sample preparation, etc. Optimization of these parameters can be determined by assessing a variety of parameters: resolution of critical pairs, signal-to-noise ratio (S/N), response factor, optimization of the separation space. Chromaleont offers solutions for the development of eco-friendly and sustainable GC approaches for the analysis of essential oils, with particular emphasis on time savings and cost reduction.

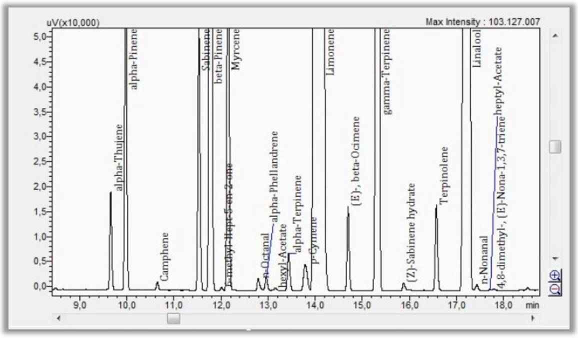


Method View - Compound Table

Integration | Identification | Quantitative | Compound | Group | Performance | Custom | QC Check | Retention Index

ID#	Name	Type	Ret. Time	Ret. Index
1	alpha-Thujene	Target	9.146	927
2	alpha-Pinene	Target	9.379	933
3	Camphene	Target	10.154	953
4	Sabinene	Target	10.890	972
5	beta-Pinene	Target	11.123	978
6	6-methyl-Hept-5-en-2-one	Target	11.433	986
7	Myrcene	Target	11.627	991
8	n-Octanal	Target	12.246	1006
9	alpha-Phellandrene	Target	12.291	1007
10	hexyl-Acetate	Target	12.516	1012
11	alpha-Terpinene	Target	12.786	1018
12	p-Cymene	Target	13.101	1025
13	Limonene	Target	13.326	1030
14	(E)-, beta-Ocimene	Target	14.047	1046
15	gamma-Terpinene	Target	14.587	1058
16	(Z)-Sabinene hydrate	Target	15.082	1069
17	Terpinolene	Target	15.847	1086
18	Linalool	Target	16.524	1101
19	n-Nonanal	Target	16.805	1107
20	heptyl-Acetate	Target	17.133	1114
21	4,8-dimethyl-, (E)-Nona-1,3,7-trie	Target	17.086	1113





Nitrogen carrier gas is used for conventional GC analysis of essential oils; it represents a valid and more sustainable alternative to common helium gas. In addition, the costs for analysis can be significantly reduced considering the high price of the helium. Chromaleont also pays particular attention at the development of peak attribution models based on the use of linear retention index (LRI). Using the algorithm "Automatic Adjustment Retention Time" (Labsolutions GC software, Shimadzu), you can determine the retention times from LRIs of target compounds and the identification results will be absolutely accurate avoiding mistaken peak attributions.

Scan me for more info

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