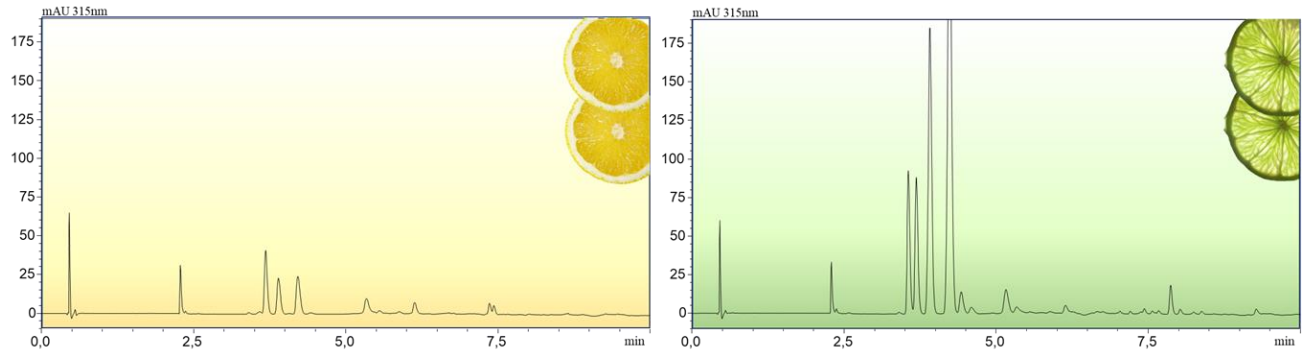


# Profile evaluation of the non-volatile fraction of cold-pressed *Citrus* Essential Oils

Cold-pressed *Citrus* essential oils, namely lemon, bergamot, lime, grapefruit, mandarin, sweet and bitter orange are obtained from the peel of *Citrus* fruits and are normally used in food, cosmetic, and pharmaceutical industries as ingredients. Oxygen heterocyclic compounds, i.e., coumarins, psoralens, and polymethoxyflavones, compose a small portion of the non-volatile fraction (10–20%) of *Citrus* essences. These compounds showed several biological effects on human health.

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## Instrumentations

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

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## 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

## 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 - Instrumentation

Supercritical fluid chromatography (SFC) is an analytical technique that involves the use of a supercritical fluid, mainly $CO_2$, as a mobile phase, to separate the components of mixtures and obtain information about their compositions. The Photo Diode Array (PDA) detector measures the entire wavelength range and may be useful in discerning between analytes with dissimilar absorbance spectra. The PDA detector, together with the retention time ($t_R$) values of the peaks examined, is of great importance for the identification of the target compounds. For full confirmation, the identification of compounds is carried out by comparison with reference materials.

The information obtained from a chromatographic analysis include a chromatogram, i.e., a graphic image of a detector output, information regarding the heights and areas of resolved peaks in a chromatogram, and their quantity.


**LabSolutions**

**NEXERA UC**

With Shimadzu Labsolutions SFC analytical management software, you can measure and analyze data, create and export reports of the analysed *Citrus* essential oils.

| P/N | Name | Remarks |
|---|---|---|
| 228-65513-58 | LC-30ADSF | - |
| 228-65514-58 | SFC-30A | - |
| 228-65502-58 | CBM-40 | - |
| 228-65508-58 | Reservoir Tray | - |
| 228-65000-58 | LC-40D XR | Modifier pump |
| 228-45209-44 | MR MIXER 180UL-2 TP | - |
| 228-65019-58 | DGU-405 | - |
| 228-65103-58 | SIL-40C XR | Cooling type, injection port rinsing and external rinsing |
| 228-59921-92 | Ghost Trap | - |
| 223-62702-92 | LabSolutions LC Workstation<br>Multi LC-PDA | - |

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

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www.shimadzu.eu

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# Merck - Consumables

As SFC can be used either for non-polar or for polar molecules, depending on the mobile phase composition and operating parameters, columns comprise a wide variety of stationary phases and polarities ranging from the most polar (such as bare silica gel) to the least polar (such as octadecylbound-silica). While pure $CO_2$ has a low polarity, similar to hexane, its eluting strength is however tunable, through variations of pressure and temperature conditions, but most importantly via the addition of organic solvent (e.g. methanol, ethanol, acetonitrile) or additives (e.g. water or acidic/basic molecules). Thanks to this adjustable polarity, SFC is suitable for the analysis of molecules with a wide range of polarities.


Merck offers a comprehensive portfolio of solvents to provide the right solution for specific applications. All Supelco® solvents are designed to fit essential oil analysis and are available in a variety of sizes, packaging materials, and with the necessary supporting documentation. Merck portfolio also includes reference materials, analytical syringes to ensure accurate solvent dilution, and Supelco® analytical vials that are available in a variety of colour, sizes, volume capacity and material composition. All vials are inert and free of extractables or leachables to avoid compromising results, and compatible with Shimadzu SFC instrumentation.

| P/N | Name | Remarks |
|---|---|---|
| 53946-U | Ascentis® Express HILIC, 2.7 µm HPLC Column | 2.7 µm particle size, L × I.D. 15 cm × 2.1 mm |
| 93102 | Furocoumarin Mix | 16 components in acetonitrile, certified reference material, *Trace***CERT**® |
| 1.11727 | Ethanol | Gradient grade for liquid chromatography LiChrosolv® |
| 1.15333 | Water | For chromatography (LC-MS Grade) LiChrosolv® |
| 80457 | Trifluoroacetic acid | Eluent additive for LC-MS, LiChropur™ |

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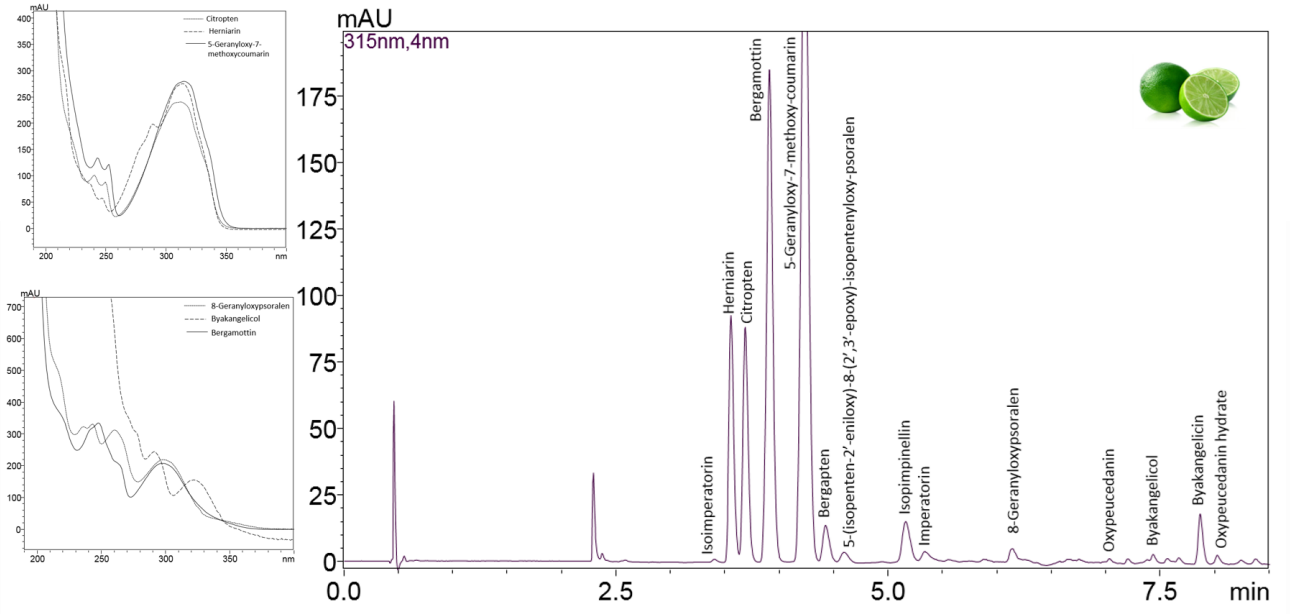
www.sigmaaldrich.com

## Chromaleont - Analytical Methods

The development of the SFC method often requires the evaluation and optimization of different parameters such as stationary phase, flow rate, injection volume, co-solvents and additives choice, temperature, and analysis time. Chromaleont offers eco-friendly solutions for the analysis of coumarins, psoralens and polymethoxyflavones using SFC-PDA system, with a focus on sustainability and reducing costs.




For this reason, in order to separate a wide range of analytes with differing polarities, $CO_2$ was mixed with ethanol and a small amount of water for SFC analysis of cold-pressed *Citrus* essential oils.

Therefore, Chromaleont considers the analytical performance of SFC-PDA analysis such as a valid and more sustainable alternative tecnology for essential oil classification in the contest of quality control of raw materials in numerous industrial fields, and hopefully improve the status quo of current analytical SFC-PDA system.

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