

Product Portfolio

Supercritical Fluid Chromatography



Inspired versatility and reliability

Supercritical fluid chromatography (SFC) – chromatography that utilizes pressurized CO₂ in the mobile phase – is seeing a surge in popularity due to its many advantages compared to conventional chromatographic techniques:

- The lower viscosity of the mobile phase allows use of faster flow rates, resulting in higher throughput with reduced solvent consumption.
- In addition to the SFC's green credentials, cost per sample can be cut substantially.
- It also offers complementary chromatographic selectivity to standard reversed phase LC separations that can be especially beneficial in the separation of chiral compounds.
- Hyphenation of SFC to mass spectrometry (MS) can lead to a significant increase in sensitivity.
- High purity fractions including little residual solvent can be collected.

Shimadzu has created a comprehensive “Unified Chromatography” analytical scale system: the Nexera UC. Unified Chromatography, or UC, characterizes the use of a very wide gradient, from a CO₂-rich supercritical/sub-critical mobile phase (SFC) to a completely liquid mobile phase like in liquid chromatography (HPLC). This is a versatile technique that allows separation of hydrophobic and hydrophilic compounds in a single analysis. To meet current needs for a reliable preparative scale instrument, Shimadzu has worked closely with the Enabling Technologies Consortium (ETC), a group of pharmaceutical and biotechnology companies, and released the Nexera UC Prep.



“SFC is changing the way we operate by opening the doors to new applications.”

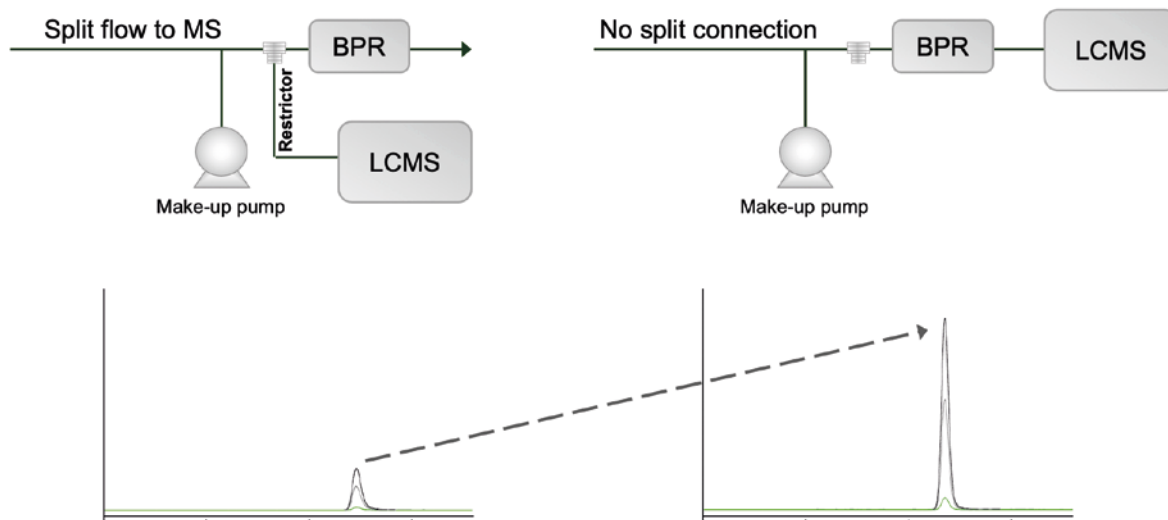
Caroline West, Associate Professor at the Institut de Chimie Organique et Analytique, Université d'Orléans, France

Unique hardware innovations make the Nexera UC the state-of-the-art choice for challenging sample separation in a wide range of application areas. This includes chiral screening, pesticide analysis, investigation of biomarkers, and determination of polymer additives in the pharmaceutical, chemical, and food industries. Both, the analytical and preparative Nexera UC systems enable customer- and application-specific solutions supported by a variety of system configurations.

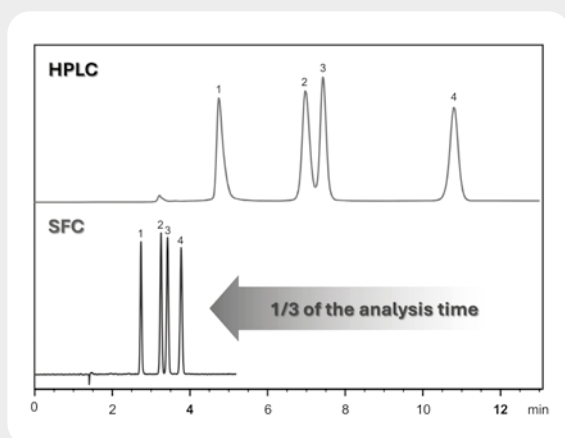
A new era of SFC instrumentation

Shimadzu's patented back pressure regulator (BPR) ensures stable pressure control, a critical factor for accurate and reproducible results in SFC. Designed for consistent performance across a wide range of flow rates and pressures, it minimizes fluctuations and improves reliability.

This compact unit responds quickly to pressure adjustments, streamlining method development. With integrated temperature control and negligible dispersion volume, it connects directly to mass spectrometers without extra interfaces or splitters – offering the potential to enhance MS sensitivity. Durable and easy to maintain, Shimadzu's BPR greatly simplifies SFC workflows.

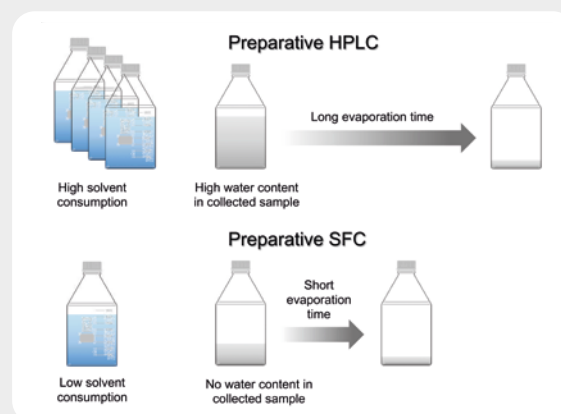


Faster separation, lower solvent consumption



Due to the low viscosity and high diffusivity of supercritical carbon dioxide, the column pressure for SFC is low even at high flow rates. This enables faster analysis and reduces solvent consumption, especially in preparative scale.

In SFC purifications, high concentrations of target compounds are recovered in an organic solvent, which saves time during analysis as well as post-processing. Since there is no water content in the recovered fraction, and most of the mobile phase is vaporized supercritical CO₂, only the organic modifier of the mobile phase remains to be collected, considerably reducing the time required to evaporate the solvent.



Fast and efficient method development

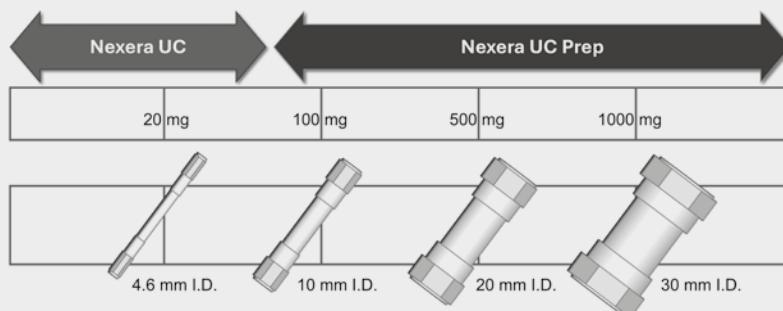
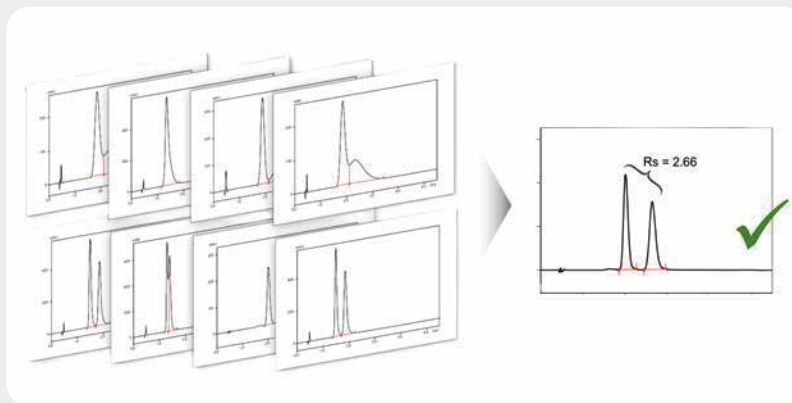
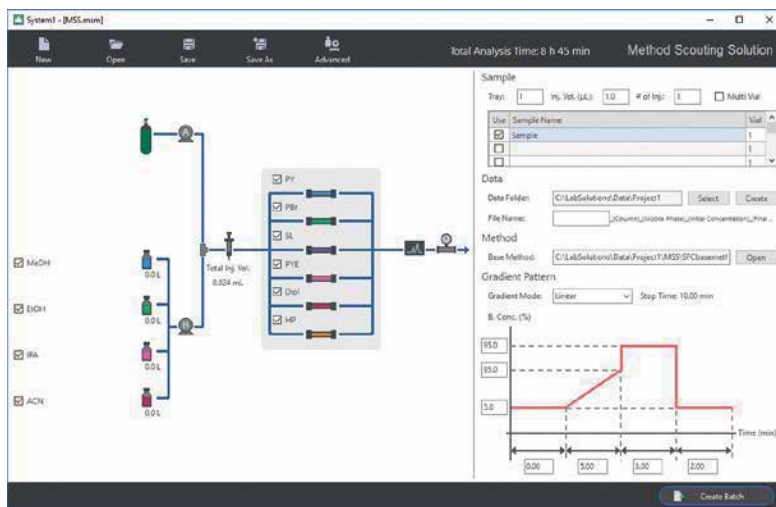
Method screening with a set of columns offering a variety of selectivities to determine optimum column and separation conditions is standard practice in SFC.

Discover efficient SFC method development with the Nexera UC Method Scouting System. LabSolutions MD, a dedicated method development software, offers automated column screening, drastically simplifying the workflow.

With its auto-blending feature, the modifier pump blends up to 4 solvents seamlessly, eliminating the need for manual pre-mixing and reducing both lab workload and solvent waste.

The user-friendly GUI of the LabSolutions MD software makes selecting analytical conditions effortless, automating tasks like run time calculation, method creation, and column rinsing.

Benefit from reduced method development time, minimized human error, and easy scale-up to preparative SFC.

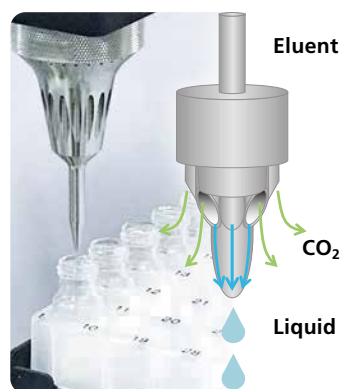


Sample collection made easy

In preparative SFC, gas-liquid separation (GLS) is essential to prevent sample loss and ensure reliable recovery during CO₂ vaporization. The patented LotusStream GLS achieves this with innovative precision.

Its unique design minimizes eluate scattering, reducing carryover and preserving even volatile compounds.

Compact and easy to maintain, the LotusStream GLS enables accurate fractionation in vessels as small as 1.5-mL vials or deep well plates, making it ideal for both preparative and analytical scale workflows.



LotusStream separator

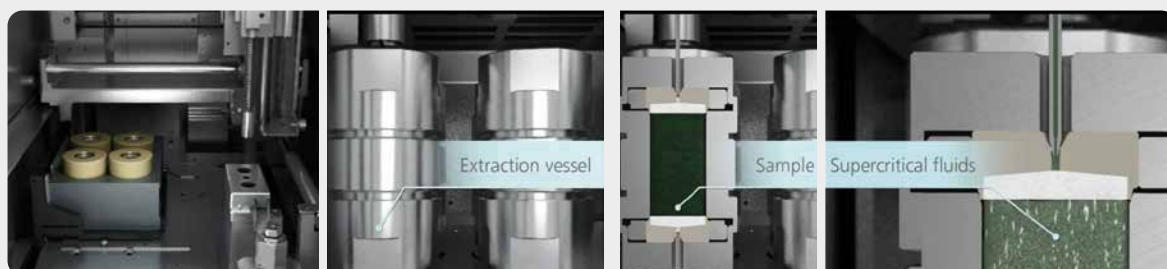
Upgrade to an analytical fraction system



Online sample preparation

The Nexera UC SFE-SFC system enhances analytical workflows by combining supercritical fluid extraction (SFE) with SFC analysis. It offers the flexibility to perform SFE either online, directly coupled with SFC analysis, or offline for standalone extraction processes.

By adjusting CO₂ pressure and temperature, the system ensures efficient and selective extraction of solid samples, such as dried blood spots, food, or polymers. Operating under light-shielding and anaerobic conditions, it preserves sensitive compounds and provides a reliable alternative to traditional liquid extractions.



Software and accessories

LabSolutions CDS offers an innovative operating environment, ensuring comprehensive data management and enhanced information security for networked laboratories. Widely used in quality control as well as research and development labs, LabSolutions meets the growing demands for analysis in pharmaceutical, chemical, food safety testing, and environmental labs.

The increasing number of samples requiring analysis necessitates faster and more user-friendly tools and software. LabSolutions provides efficient management procedures and full support for regulated environments.

Utilizing the dedicated **Prep Solution** open access software, developed in collaboration with the ETC, transitioning from analytical to preparative methods is straightforward. The software simplifies configuring parameter settings, significantly enhancing the efficiency of the preparative workflow.

The Nexera UC supercritical fluid chromatography system was co-developed with Osaka University, the Miyazaki Agricultural Research Institute, and Kobe University in a project of the Japan Science and Technology Agency. Since its release in January 2015, it has been recognized as an innovative system worldwide. The Nexera UC is now widely used in government agencies, universities, and environmental testing laboratories, as well as in pharmaceutical and food industries.

Columns and consumables

Shim-pack UC-X series columns are designed specifically for use in SFC systems. Retention behavior can vary significantly, depending on the type of stationary phase. During method development, a variety of columns should be tested to achieve optimum separation. The Shim-pack UC-X series offers a wide range of different selectivities and available column sizes to enable seamless scale-up from analytical to preparative SFC applications.

Our extensive range of consumables includes vials, caps, inserts, and spare parts, ensuring you have everything you need for your chromatography requirements.

Get more information: www.shimadzu.eu/columns-sfc



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