LC-4000 series

SFC system

Supercritical Fluid Chromatography System

JASCO

Innovative chiral separation technology used in Supercritical Fluid

The effect of the chiral compounds is the key factor in the pharmaceutical industry, and in order to evaluate the enantiomer, the chiral searation is taken up as a main theme. As a solution, Supercritical Fluid Chromatography (SFC) is drawing attention from many researchers. Since the separation capacity of SFC is higher than the one of HPLC, the SFC is powerful tool for separating the chiral compounds which is hard to separate by using HPLC.

For Analytical System

System configuration example of
Analytical SFC System

The physical characteristics exhibited by supercritical fluid include a diffusion coefficient of dissolved molecules that is a hundred times greater than it is in liquid and a viscosity that is at least one digit smaller. A SFC system, which employs such a medium as a mobile phase, can be expected to serve as a separation analysis method that can rapidly perform separation without any degradation in separation efficiency, even at fast flow rates, due to a rapid mass transfer inside the column when compared with high-speed liquid chromatography that uses liquid as the mobile phase.

<Analytical SFC>
Specification:

Flow rate:	1 - 8 mL/min
Column size:	I.D. 2 - 4.6 mm
Injection volume:	- 100 µL

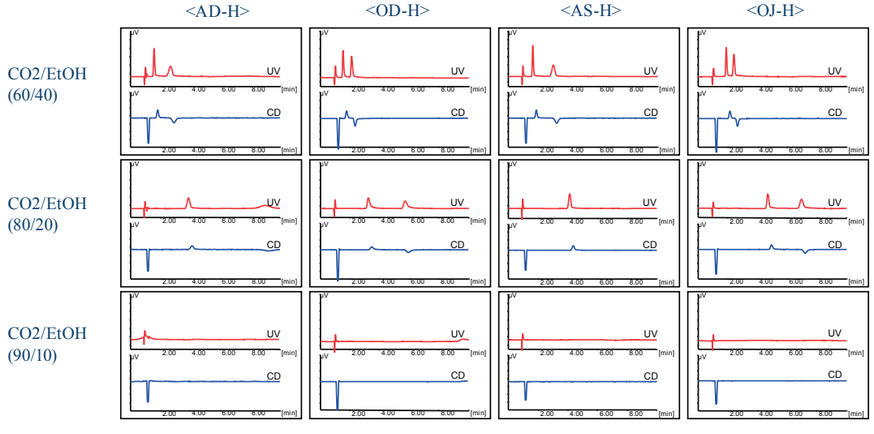
Wide range of detectors

JASCO offers a wide range of detectors with high pressure cells UV, Diode Arracy (realtime collection of 3D spectra and chromatogram) and the only CD detector available for SFC. Especially, JASCO original CD detector measures optical isomers with circular dichromatic absorption, and can measure both CD and UV chromatograms as well as g-factor (CD/UV) chromatograms. Since g-factor in particular has a proportional relationship with the composional ratio of optical isomer sample, the CD detector can perform compositional measurements and high purity fractionation for non-separated peaks.

Method development by using SFC screening

Before separating and collecting the target chiral compound, finding the optimum sepration condition is required (column, solvent, etc.). In order to create the measurement conditions and measure the samples automatically, JASCO can offer the SFC screening for method development, which has the benfits of labor-saving and operation improvement.

<SFC Screening for Warfarin>



Column: CHIRALPAK AD-H/AS-H, CHIRALCEL OD-H/OJ-H
(4.6 mm I.D. x 150 mm L)
Mobile phase: CO2/EtOH
Flow rate: 2.0 mL/min

Column Temp.: 40 degree C
Pressure: 20 MPa
Detection WL: UV 230 nm, CD 230 nm
Sample: 0.02 %, 5 µL

For Preparative System

System configuration example of
Semi-Prep SFC System

The Semi-Prep SFC and the Prep SFC system are aplied to separtion and purification with high recovery. When carbon dioxide is used as the medium, gasification will occur simply by keeping the separated and fractionated sample at an atmospheric pressure, making this one of the techniques capable of highly efficient refining with few post-processing hassles, such as elimination solvents after preparative isolation. This offers a host of advantages, including cost cuts related to the expense of purchasing solvents and discarding organic solvents among other things.

<Semi-Prep SFC>
Specification:

Flow rate:	- 20 mL/min
Column size:	I.D. 4.6 - 10 mm
No. of fractions:	6 or 56
Injection vol.:	- 1 mL
Preparation vol.:	some mg

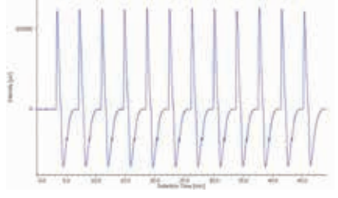
<Prep SFC>
Specification:

Flow rate:	- 150 mL/min
Column size:	I.D. 10 - 30 mm
No. of fractions:	8
Injection vol.:	- 20 mL
Preparation vol.:	some g

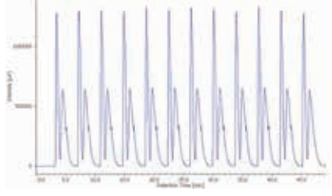
Improvement of sample throughput by stuck injection

By shortening the sample injection interval to let chromatograms overlap, the separation in prep mode can be done efficiency. It means that the separation and purification of even a large amount of sample can be carried out with high recovery and high purity in short time.

<Separation of Flavanone by stuck injection>



<CD>



<UV>

Column: CHIRALPAK AD-H
(20 mm I.D. x 250 mm L)
CO_2 flow rate: 34 mL/min
Modifier: CH_3OH 6 mL/min

Column Temp.: 40 degree C
Pressure: 20 MPa
Detection WL: 310 nm
Sample: Flavanone 30.2 mg/mL, 1000µL

Unique sample collection mechanism

In the SFC using CO2 as mobile phase, it is one of main problems when collecting eluted sample that the separated sample is flown apart due to volume expansion (approx. 500 times) of released CO2. In order to improve the collection rate, JASCO has developed a Micro Cyclone Separator (MCS) for Semi-Prep SFC system, and a dedicated fraction collector for Prep SFC system.

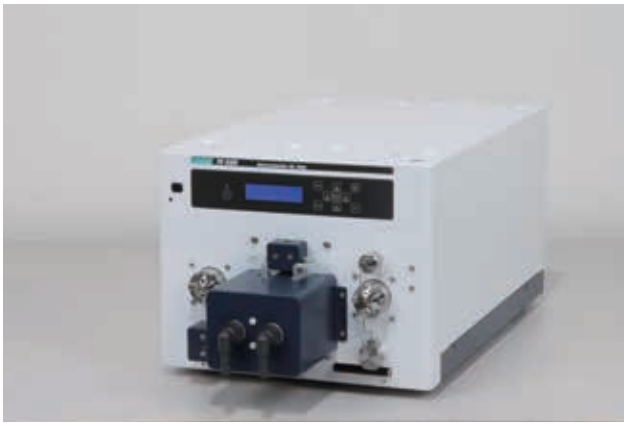
<Micro Cyclone Separator (MCS)>

Module for SFC

JASCO's modular SFC platforms have been optimized and refined over the last 20 years to provide reliable, worry-free performance for a wide variety of applications.

CO2 Delivery Pump

JASCO offers the PU-4380 for analytical scale applications, the PU-4386 for applications ranging from analytical to semi-preparative isolation, and the PU-4388 for high-volume preparative isolation.

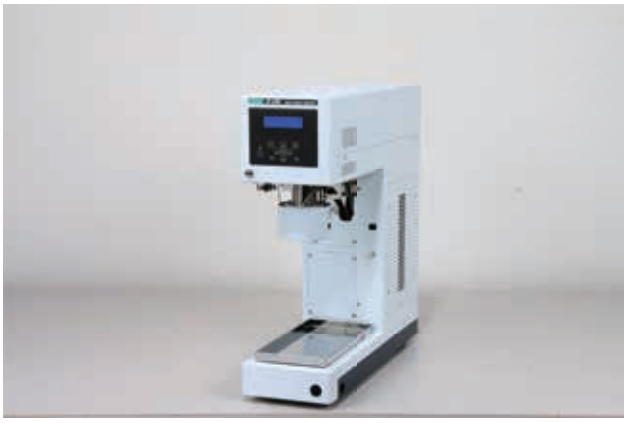


Specification:

Flow rate:	0.1 to 2 mL/min (PU-4385)
	0.5 to 5 mL/min (PU-4380)
	1 to 15 mL/min (PU-4386)
	10 to 40 mL/min (PU-4387)
	10 to 120 mL/min (PU-4388)
Max pressure:	50 MPa
Cooling method:	Peltier (PU-4385 and PU-4380)
	Cooling jacket + Coolant circular bath (PU-4386, PU-4387 and PU-4388)

Back-Pressure Regulator

The patented JASCO back-pressure regulator employs a high-speed switching valve to ensure that a constant back pressure is maintained at all times, regardless of the gas flow rate. Most other systems use a restriction device which is flow dependent and hence is unable to provide the essential constant pressure conditions. It also presents a significant reduction in any precipitation buildup in the flow line



Specification:

Operating pressure range:	1.0 to 50.0 MPa
Flow rate:	150.0 mL/min
Pressure adjustment precision:	±2 % or ±0.2 MPa

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