Analytical SFC System





Performance Innovation Reliability



The SFC-4000 Analytical SFC System provides flexible configurations for any type of separation. The SFC-4000 can be set-up for use as a single column/single detector system or as a multicolumn/multi-detector system for rapid method development. ChromNAV is an easy to use data system with a user-friendly interface and comprehensive automated data analysis. The ChromNAV Method Scouting Module is used for fast column and solvent screening.

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SFC Advantage

Supercritical Fluid Chromatography requires a supercritical fluid (most commonly CO_2) as the primary component of the mobile phase. The intrinsic characteristics of low viscosity and high diffusivity of supercritical CO_2 makes SFC faster and more efficient than traditional HPLC. SFC achieves faster flow rates with shorter analysis times without the requirement for higher pressures like UHPLC. As in reverse phase HPLC, an alcoholic co-solvent or modifier can be combined with the CO_2 to increase the

solvation strength and can be used isocratically or as a gradient. The components in a SFC system are the same that can be found in any HPLC system, with the addition of a high pressure flow cell for the detector and a back pressure regulator (BPR). The BPR applies a carefully controlled pressure to the outlet of the column to maintain accurate supercritical conditions, and is an integral part of the performance of the system.



Performance



Excellent isocratic and gradient retention time reproducibility $\leq 0.08\%$ RSD

Advantages

- 1. Faster analysis times
- 2. Higher selectivity with longer and smaller particle columns
- 3. Reduction in total solvent consumption
- 4. More environmentally-friendly solvents
 - a. CO₂ replaces hexane or heptane
 - b. Alcohols typically used as co-solvents
- 5. Longer column lifetimes
- 6. Orthogonal to HPLC methods
- 7. Easy removal of mobile phase after preparative fractionation
- 8. Reduction in waste disposal





Extremely stable and accurate flow control and back pressure



PDA provides all wavelengths, peak purity, spectra searching and 3D plots



Injection reproducibility ≤ 0.5% RSD (20 overlaid injections)



Outstanding reliability for worry-free operation injection after injection



World's first and only FP detector for SFC providing sensitivity up to 400 times higher than UV

SFC



The CO_2 pump includes peltier cooling (with pumphead temperature monitoring) to control the density of the mobile phase for accurate CO_2 flow with excellent retention time reproducibility.

Automatic, shut-off valves close the CO_2 inlet and outlet (and co-solvent pump) to isolate the pumps for quick and simple priming when flow is not pumping.

- The autosampler has a sample capacity of up to 180 – 2mL samples with both full-loop and variable-loop injection up to 100µL. For increasing throughput, towards the end of the current separation, the next sample is pre-loaded into the loop to eliminate the loading time between injections.
- A variety of column ovens are available for single or multiple columns with options for built-in column selection valves to ensure temperature equilibration for both columns and valves to minimize band broadening in the peaks.
- The patented back pressure regulator has unmatched pressure regulation precision and accuracy with an extremely low noise baseline and excellent retention time reproducibility.

SFC-MS



Control

Auto-Tuning and Performance Checks can be made easily and routinely.



Detectors



UV-4070/4075 UV-Visible Detector Wavelength ranges: UV-4070: 190-900nm UV-4075: 190-600nm



MD-4010/4015/4017 PDA Detector Wavelength ranges: MD-4010: 190-900nm MD-4015: 190-600nm MD-4017: 190-400nm



CD-4095 Circular Dichroism Detector Wavelength range: 220-460nm



FP-4020/4025 Fluorescence Detector Wavelength range: 200-900nm

The SFC-4000-MS combines all of the advantages of SFC with the selectivity and sensitivity of a mass spectrometer.

- The CMS single quadrapole mass-spectrometer is a perfect complement to SFC. As CO₂ passes out from the BPR it depressurizes and expands to a gas at a rate of 1:500, which assists with the nebulization at the ion source.
- Multiple source options include; ESI, APCI and ASAP, with positive/negative ion mode switching for the high range detection of M/Z up to 2000 AMU.
- The ChromNAV-MS module includes full control and acquisition of the CMS, with auto-calibration and auto-tuning for easy optimization.

Data

ChromNAV-MS system control with convenient access to all MS data.

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Explore the MS spectra, and extract ion chromatograms with just a few clicks.

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Parallel SFC



The Parallel SFC provides the highest throughput in column and solvent screening for chiral and achiral compounds.

- The system provides simultaneous elution on 4 or 5 columns for up to 5 times the throughput of traditional SFC.
- Up to 20 columns and 10 solvents will cover a wide range of column-solvent combinations to achieve the best pair.
- Single column-solvent optimization is then performed to obtain the best separation for scaling up to preparative purification.



Control

ChromNAV-MS system control with The screening sequence of up to 20 columns and 10 solvents can be setup in just a few clicks.



Data

The simultaneous elution view provides live evaluation of the separation.

allows for quick determination of the best column-solvent combination.

The screening results previewer



ChromNAV Software

Instrument Control

ChromNAV uses methods and sequences for quick and easy set-up of sample analysis. The autosampler sample pre-load feature eliminates the sample loading time between injections further increasing throughput of the system. The sequence includes peak integration, peak table, calibration and fully customizable reports for complete automation from sample analysis to report printing. Each component in the system is subject to performance monitoring and the information is recorded with the acquired data file together with the method for a complete history of operation.

Data Acquisition

Chromatograms can be monitored and acquired simultaneously from multiple detectors including; UV-visible, 3D PDA, fluorescence, CD, SIM, XIC, TIC and mass spectrum. The mass spectrum can also be analyzed after acquisition to identify unknown peaks. ChromNAV has many features for data analysis and processing, both automatically during the run and extensively post run. Raw data and peak calculation results can be exported automatically in several formats including CSV (for Microsoft Excel).



SFC Achiral Report



re	sak intorm	ation		
#	tR [min]	Area [µV·sec]	Height [µV]	Area
1	2.338	200916	56834	11.654
2	2.620	573958	152722	33.29
3	4.047	169562	33020	9.83
4	4.229	413022	76489	23.95
5	4.492	22351	3943	1.29
6	5.037	244166	62004	10.06

Deal Information

Method Development

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				Retention Time[r	ninj				Valve Port#5 Name	Ethanol TEA		
	Event1 -	-					_		Valve Port#6 Name	IPA TEA		
	Event2 -						_		Valve Port#7 Name			
	Event3 -								Valve Port#8 Name			
	event4 -								Valve Port#9 Name			
		0.0	2.0	4.0 6		80 1	0.0		Valve Port#10 Name			

Solvent Selection

Solvent selection valve, built into the cosolvent pump (Options 1, 6 or 10). Solvents can be named in the method and are saved with the data.

Sett	ina				# Name	Sample #	Recent#	Equilibration Timelmini	Description	Sample Name	Sample Description
Refe	rence Control Met	3ml ora	d Sto40% 2	5C	1 PUT-VALVE[1] COT-VALVE[1 1	0 1	1	31	0		
. De	cameter 1				2 PUT-VALVE[1] COT-VALVE[23	9 1	1	34	0		
	A de	D			3 PUT-VALVE[1] COT-VALVE[3 3	9 1	1	31	0		
	lone	Pullip #	1		4 PUT-VALVE[1] COT-VALVE[44	9 1	1	34	0		
0	nation	vave			E BRI-AWAEIU COI-AWAEIEU	Q 1	1	34	2		
Va	be	1; 2; 3;	4; 5; 6;		6 PUT-VALVE[1] COT-VALVE[60	1 1		31	0		
+ Pa	rameter 2				7 PUT-VALVE[2] COT-VALVE[1 1	0 1	1	34	2		
Mo	chale	Oven #:			8 PUT-VALVERSICOT-VALVERS	1 1		31	2		
Co	ndtion	Valve			9 PUT VALVEP] COT VALVEP 3	0 1	1	31	5		
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Method Scouting

The method scouting module includes a workflow for building a simple sequence to screen up to 10 solvents and 10 columns without having to develop a method for each separation. At the end of a method scouting the optimal separation can be selected and a method is created ready for use.



Column Selection

Column selection valve, built into the column ovens (Options 1, 6 or 10). Columns can be named in the method and are saved with the data.



Chromatogram Selection

Up to 48 chromatograms can be previewed and compared together in a single view to identify and select the optimal combination of solvent and column for the separation.

Specifications

SFC System				
	CO ₂ Flow rate	0.2 - 10mL/min		
	Co-Solvent Flow Rate	0.2 - 10mL/min		
Pump	Flow Rate Accuracy	±1% or ± 2µl/min		
	Flow Rate Precision	0.05% RSD		
	Solvent Selection	Up to 10 solvents		
	Injection Volume Range	0.1 - 100 μL		
	Number of Samples	up to 180 (2mL vials)		
Autoamalaa	Injection Accuracy	± 0.1% or less		
Autosampier	Injection Precision	0.25% RSD or less		
	Carryover	0.01% or less		
	Optional Autosampler Rack Temperature Control	4 - 40°C		
Column Oven	Column Temperature Range	Ambient -15°C - 100°C		
Column Oven	Column Selection	up to at least 20 columns		
	Maximum Pressure	500 bar		
Back Pressure Regulator	Dead Volume			
	Pressure Stability			

UV-Visible and Circular Dichroism	UV-4075	UV-4070	CD-4095	
Wavelength Range	190 - 600 nm	190 - 900 nm	220 - 460 nm	
Noise Level	± 0.2 × 10-5 AU (230	0.04 mdeg (at specified conditions)		
Drift	±1x10-4 AU/h (2 At constant room ter	0.1 mdeg/h (at specified conditions) At constant room temperature		
Data Output	100 Hz			
Flow Cell	Temperature controlled, tapere	Tapered cell, path length 25 mm		

Photo Diode Array	MD-4010
Wavelength Range	190 - 900 nm
PDA Elements	1024 ch
Slit Width	1, 4, 8 nm
Data Acquisition Rate	
Flow Cell	

Fluorescence	MD-4010	MD-4015		
Light Source	Xenon short arc lamp			
Wavelength Range	220 - 700 nm, Option up to 900nm			
Sensitivity	Raman peak of water S/N > 1400	Raman peak of water S/N > 2300		
Data Output	100 Hz			
Temperature Control	-	OFF, ambient -10°C - 40°C		

Mass Spectrometer	CMS-S	CMS-L			
Ion Source	ESI, APCI & AS	SAP			
Mass Range	Up to 1200 m/z	Up to 2000 m/z			
Polarity	Positive and Negative switching in same analysis				
Sensitivity	10pg reserpine (FIA – 5uL injection at 100uL/min S/N 100:1 (RMS) with SIM				
Acquisition Rate	10,000 m/z units/sec				
Accuracy	0.1 m/z units				
Stability	0.1 m/z over a 12 hour period (65-75°	F operating temperature)			

	MD-4015	MD-4017			
	200 - 600 nm	200 - 400 nm			
	51	2 ch			
	4 nm				
100 spe	ctra/sec				
	Path length 10 mm				



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signed and manufactur -9001- and ISO-14001-o JASCO Corporation