SPECIFICATIONS

Optical system
Light source: Hg-Xe lamp (150W)
Measurement wavelength range: 220 ~ 420 nm
Measurement range: 0 ~ ±1000 mdeg
Spectral bandwidth: 20 nm
Wavelength accuracy: ±3 nm
Photometric system
Photometric method: PEM modulation method (single beam)
Noise level: 0.03 mdeg (at 291 nm)
Baseline drift: 0.05 mdeg/hr (at 291 nm)
Gain: x1, x10
Response: FAST, STD, SLOW
Flow through cell
Flow cell: Front-loading cassette cell
Flow cell path length: 25 mm
Optional flow cell: 1, 5 and 10 mm path cell and high-pressure cell for SFE/SFC

Signal input/output
Recorder output:
CD output: 10 mV/full scale
0.0005 ~ 1.28 deg/FS (full scale), S (short)
UV output: 10 mV/full scale
Integrator output:
CD output: 1V/1deg
UV output: 1V/AU and 1V/2AU
Others: Marker input, marker output, leak output program (RUN/RESET), auto zero input

Flow through cell
Flow cell: Front-loading cassette cell
Flow cell path length: 25 mm
Optional flow cell: 1, 5 and 10 mm path cell and high-pressure cell for SFE/SFC

Program function
Time program: Wavelength, measurement range, response, auto zero
Spectrum scanning: 220 ~ 420 nm (both of CD and UV)
Memory: 10 files

Self-diagnosis
Self-diagnosis: Memory (RAM, ROM), lamp and DC power supply

Others
Power requirement: AC 100 ~ 240V ±10% 50/60Hz
Power consumption: 400VA
Dimension: 300 (W) x 470 (D) x 230 (H) mm
Weight: Approx. 21 kg

STANDARD ACCESSORIES

Recorder cable	2 pcs
Marker cable	1 pc
Syringe, 5 mL	1 pc
Syringe needle	1 pc
Compression screw, 1/16”	2 pcs
Ferrul, 1/16”	2 pcs
Tube, SST, 1/16” O.D. x 0.8 mm I.D. x 300 mm	1 pc
Screwdriver, phillips	1 pc
Wrench, 1/4” x 5/16”	1 pc
Spare fuses	2 pcs
AC power cable	1 pc

ORDERING INFOMATION

6838-J002B	Model CD-2095	Circular Dichroism Detector
6837-J002B	Model OR-2090	Chiral Detector
6824-J002B	Model UV-2070	UV/VIS Detector (~ 900 nm)
6825-J002B	Model UV-2075	UV/VIS Detector (~ 600 nm)
6826-J002B	Model UV-2077	Multi-wavelength UV/VIS Detector
6832-J002B	Model MD-2015	Diode Array Detector (~ 900 nm)
6831-J002B	Model MD-2010	Diode Array Detector (~ 600 nm)
6829-J003B	Model FP-2020	Fluorescence Detector
6833-J002B	Model RI-2031	Refractive Index detector
6836-J002B	Model CL-2027	Chemiluminescence Detector
6818-J002B	Model PU-2080	HPLC Pump
6823-J003B	Model PU-2089	Quaternary HPLC Pump
6820-J002B	Model PU-2085	Semi-micro HPLC Pump
6821-J002B	Model PU-2086	Semi-preparative HPLC Pump
6822-J002B	Model PU-2087	Preparative HPLC Pump
6819-J002B	Model PU-2080i	Bio-inert HPLC Pump
6823-J004B	Model PU-2089i	Bio-inert Quaternary HPLC Pump
6828-J008B	Model AS-2059	Autosampler
6827-J005B	Model AS-2055	Autosampler
6827-J006B	Model AS-2057	Autosampler
6834-J002B	Model CO-2060	Column Oven
6835-J002B	Model CO-2065	Column Oven

● Specifications are subject to change without notice.

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ISO 9001 Certified
Products described herein are designed and manufactured by ISO-9001-certified JASCO Corporation.

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High performance Liquid Chromatograph
LC-2000*Plus* Series

Circular Dichroism Chiral Detector

CD-2095

The new CD-2095 has been developed as an innovative CD (Circular Dichroism) detector, using the same technology applied in conventional CD spectropolarimeters, but optimized to meet HPLC requirements. The CD-2095 detector can simultaneously determine both CD and UV absorption of the sample in the same cell for direct determination of optical purity. CD is based on the differential absorption of right and left circularly polarized light due to the existence of a chiral chromaphore and is a much more specific technique than OR (Optical Rotation) or Polarimetry. In the past, large and expensive CD spectropolarimeters have often been modified for use as a CD detector in an HPLC systems.
The CD-2095 can easily be interfaced with the JASCO HPLC system using the JASCO chromatography data systems.

Chiral separation has become one of the most important application areas in HPLC. The increasing demand for chiral chromatography in various fields, such as drug analysis, drug discovery, biochemical analysis, natural product analysis, organic synthesis, etc. have resulted in a parallel demand for better chiral separation and detection technology. Recent advances in chiral column technology are boosting the use of chiral chromatography in more and more laboratories, however, advances in chiral detection technology have only recently met the demands required in terms of sensitivity and selectivity.

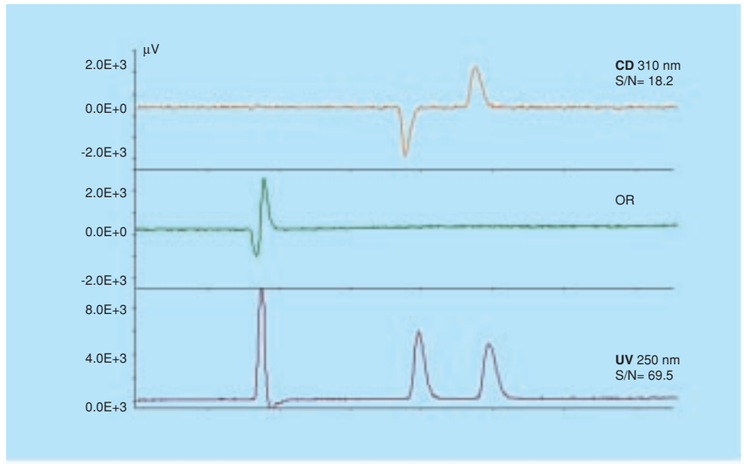
Features
- Unmatched sensitivity and stability
- Simultaneous CD and UV detection
- Direct Optical Purity determination
- Artifact free design
- Compact, easy to use package
- Universal HPLC compatibility
- Spectral scanning capability

PERFORMANCES

Highly sensitive detection

Chromatograms of Flavanone (0.1 µg injected) for the CD-2095, the OR-2090 OR detector and the UV-2070/2075 UV/VIS detectors are shown in Fig. 1. A 0.1 µg injection still gave a CD chromatogram showing good signal-to-noise ratio (S/N). The UV detector also offered a good chromatogram. However, the OR detector failed to give any peak. From S/N calculation, the CD-2095 gave approximately 200 times higher sensitivity than the OR detector. Also it is remarkable that both UV and OR detectors gave significant solvent peaks which were not observable in the data from the CD-2095 as a result of the CD dual beam signal from the difference in left and right absorption. The absorbance change without CD would be canceled.

Fig. 1 Optical Resolution of Flavanone



Conditions (Flavanone)

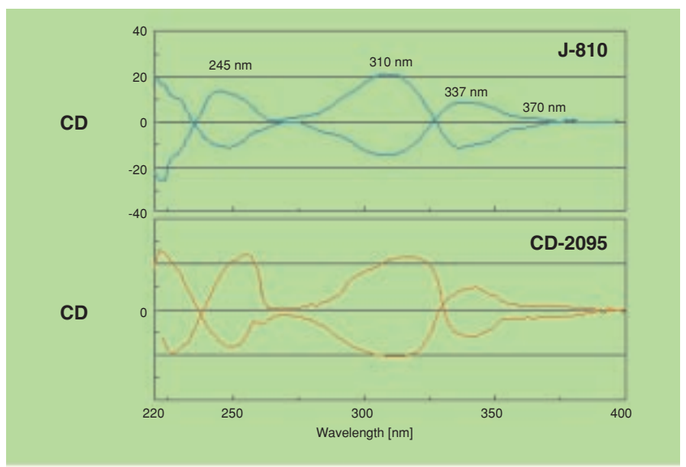
Column:	CHIRALCEL OD (4.6 mm I.D. x 250 mm length)
Eluent:	n-Hexane / IPA (90 / 10)
Flow rate:	1.0 mL/min
Temperature:	25 °C
INJ. VOL.:	10 µL
CD-1595	
Scale:	1 mV = 1 mdeg
Response:	Standard
Polarity:	+
OR-990	
Scale:	1 mV = 1 mdeg
Gain:	x 10
Response:	Standard
Polarity:	+

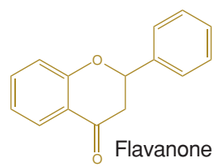
Upper: CD chromatogram at 310 nm by CD-2095
Middle: OR chromatogram by OR-2090
Lower: UV chromatogram by UV-2070/2075

CD Spectral collection

Both CD spectra of flavanone collected with the CD-2095 and a conventional CD spectropolarimeter JASCO Model J-810 are shown in Fig. 2. The major peaks at 245, 310 and 337 nm are in good agreement with each other.

Fig. 2 Flavanone CD Spectra

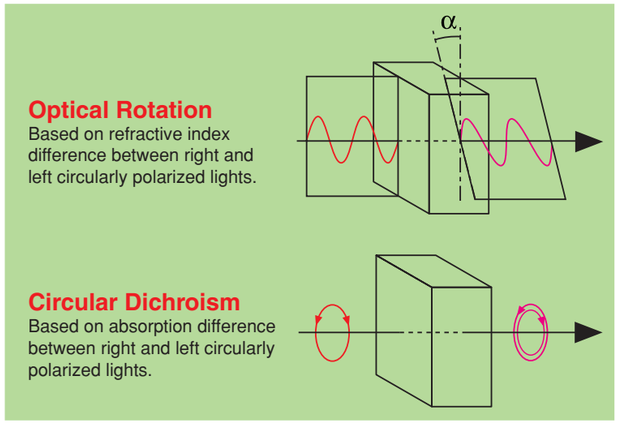




OPERATION PRINCIPLE

Schematic diagrams of operation principles for both Optical Rotation and Circular Dichroism techniques are shown in Fig. 3. An OR detector measures an angle of rotation when linearly polarized light passes through a flow cell containing optically active compounds. This is due to difference in light propagation velocities, i.e. refractive indices, of right- and left-handed circularly polarized lights. Since the sample is in a liquid stream, multiple reflections off the cell wall and other effects due to gradient changes occur within the flow cell. These effects cause depolarization and gradient artifacts resulting in a reduction of sensitivity and false peaks.

Fig. 3 Optical Rotation and Circular Dichroism Phenomena



A CD detector can differentiate between enantiomers by measuring the difference in absorbance of right and left-handed circularly polarized light. This principle of detection gives much higher intrinsic stability and high sensitivity. Unlike single beam measurements made by OR based detectors the CD measurement of differential absorption is performed within 20 micro seconds, resulting in virtual dual beam detection. A CD detector can thus generate chiral signals with higher sensitivity and stability and is not effected by gradient elution common in drug analyses.

Schematic diagrams of optical system of the OR-2090 and the CD-2095 are detailed in Fig. 4. In the OR-2090, the light from the source is polarized and modulated by a Faraday cell and is then passed through the flow cell. The optical rotation of the sample is measured by the analyzer which determines the change in the intensity of the output light. The change in the intensity is measured by the photodiode and output via an amplifier.

In the CD-2095, the light from the source is dispersed by the diffraction grating in order to select an optimum measurement wavelength. The light is directed to a polarizer, and then modulated alternately between right- and left-handed circularly polarized light. The light is then passed through the flow cell and the intensity of each beam is detected by a photodiode. The two opposite polarized light signals are separated by the electronics and the difference in absorption is determined and expressed as the CD signal. The UV absorption is also measured simultaneously and collected as a second data channel.

Fig. 4 Optical system of OR-2090 and CD-2095