SEDEX LT-ELSD™

Low Temperature - Evaporative Light Scattering Detectors

THE RESULT OF 25 YEARS OF EVOLUTION

SEDEX LT-ELSD™

Low Temperature
Evaporative Light-Scattering Detectors

SEDERE

SENSITIVITY
FLEXIBILITY
EXPERIENCE

SENSITIVITY

FLEXIBILITY

EXPERIENCE

GETTING MORE OUT OF YOUR HPLC, U-HPLC, LC/MS, AND SFC ANALYSIS

Introducing SEDEX detectors

SEDERE develops, manufactures, distributes and supports SEDEX detectors, the most complete and versatile product line dedicated to Low-Temperature Evaporative Light-Scattering Detection (LT-ELSD™). As one of the pioneers of this detection mode, SEDERE remains exclusively focused on this technology as its core competency.

As the industry leader, SEDERE leverages decades of experience and customer knowledge to continually raise the bar for High Sensitivity, High Flexibility and High Fidelity detector performance for chromatography laboratories.

The unparalleled selection of five SEDEX LT-ELSD™ models can satisfy both very high performance requirements and budget limitations for all analytical and preparative chromatography applications from basic research to quality control.

Evaporative Light-Scattering Detectors (ELSD) provide a Universal detection mode for the following analysis technologies:

- Standard HPLC,
- U-HPLC,
- HTLC,
- µ-HPLC,
- GPC,
- Preparative HPLC,
- Flash Chromatography,
- Counter Current Chromatography,
- SFC.

ELSD doesn't rely on the optical properties of the analyte, making this detection mode ideal for all compounds less volatile than the mobile phase, including those with no chromophore or widely differing extinction coefficients.

This detection mode is able to accurately measure a wide range of analytes with consistent response and is therefore an extremely useful technique to get the complete picture of complex samples.

In some cases, SEDEX LT-ELSD™ presents great advantages over UV, RI and MS:

- UV detection fails to detect compounds without chromophores.
- RI detection lacks sensitivity, cannot be used with gradient and is often difficult to operate due to drift and instability.
- MS necessitates specific technical skills to be operated and cannot be used when analytes are difficult to ionize.

Typical applications using ELSD include Lipids, Carbohydrates, Surfactants, Polymers but also Pharmaceutical High Throughput Screening, Peptides and Proteins, Natural Products and small molecules such as Amino Acids (without any derivation step) or Inorganic Ions (without the need of any additional post-column device). SEDEX LT-ELSD™ is commonly used in Industrial, Governmental and University research and control laboratories.

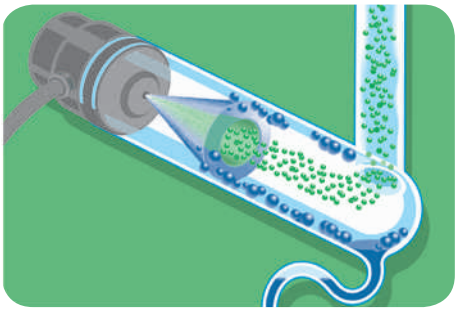
Features

- High sensitivity for semi-volatile and thermo-sensitive compounds,
- Lowest background noise to provide excellent S/N ratio,
- Optimization of peak shape and peak width,
- Consistency of operating protocols,
- Compatibility of nebulization with any HPLC protocol,
- Prevents contamination of critical detector components,
- User friendly, low maintenance system,
- Integrates readily with HPLC software with drivers.

Sedex Technology

- The strength of the real Low Temperature technology,
- Enhanced digital signal processing,
- SEDEX Automated Gain Adjustment (SAGA),
- Nebulizer design for all applications,
- Data rate up to 100Hz,
- Complete, efficient and reliable information and SOP,
- Safety features, patented Gas Supported Focusing (GSF™),
- Plug-and-play detector, power-down methods,
- RS 232, USB.

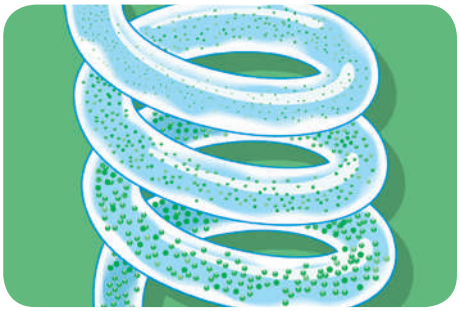
THREE STAGES OF SEDEX LT-ELSD™, EACH OPTIMIZED FOR HIGH PERFORMANCE DETECTION



NEBULIZE ELUENT AND SELECT SMALL DROPLETS TO MINIMIZE BACKGROUND NOISE

The eluent from the column is mixed with an inert gas and goes through the narrow orifice of a nebulizer to generate a homogeneous mist. This fine mist is composed of droplets of mobile phase containing the eluting compound of interest.

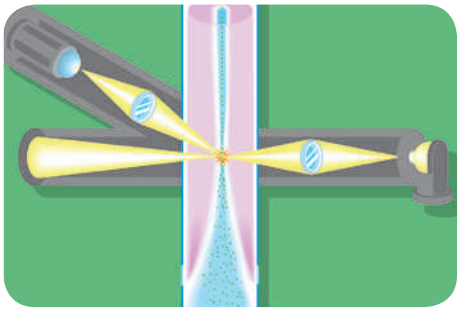
SEDEX LT technology allows the selection of droplets as a function of their size in order to prevent larger droplets from entering the evaporation (drift) tube. Large droplets would require higher temperatures to be dried, resulting in increased background noise. This selection of droplets by size enables detection using a very low evaporation temperature, with resulting low baseline noise and excellent sensitivity to solutes, including semi-volatile solutes.



EVAPORATE AT LOW TEMPERATURE EVERY TIME SO YOU WON'T MISS ANY COMPOUND

The nebulized eluent goes through a heated tube to evaporate the mobile phase.

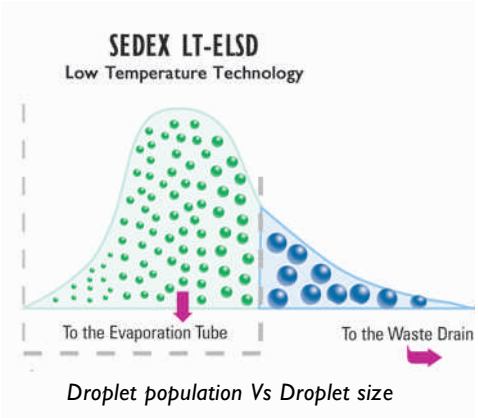
Solute molecules are obtained from the mist using a heated evaporation (drift) tube, at a low temperature. All SEDEX detectors are designed to evaporate mobile phases with high boiling points at very low temperatures. This unique feature minimizes the potential for evaporation or thermal decomposition of the compounds of interest, and makes the SEDEX LT technology a more reliable way to detect everything in the sample.



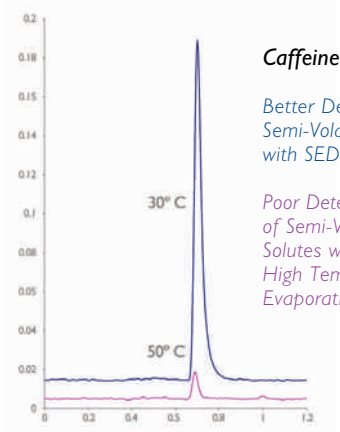
DETECT LIGHT-SCATTERING USING GAS SUPPORTED FOCUSING (GSF) FOR LESS MAINTENANCE AND BETTER DATA

The stream of solid particles enters a flow cell which includes a light source and a photomultiplier or a photodiode. The intensity of the light scattered by the particles is directly related to the mass of the eluted compound.

The solute molecules from the mist, assisted by GSF™, go through an optical head designed to measure the scattered light. GSF™ involves the addition of gas to focus the solute particles within the optical head for enhanced detection and safety.



Droplet population Vs Droplet size



Caffeine Injection

Better Detection of Semi-Volatile Solutes with SEDEX LT-ELSD™

Poor Detection of Semi-Volatile Solutes with High Temperature Evaporation

- *All SEDERE detectors feature low-temperature operation to ensure that excellent sensitivity is provided even for semi-volatile or thermally labile compounds. These detectors can be used with conventional analytical and preparative Liquid Chromatography, as well as with U-HPLC, HTLC, μ-HPLC, GPC, Flash Chromatography, CCC, and SFC.*

Why Low-Temperature evaporation is important in ELS detection

In an ELSD, the nebulized eluent is evaporated by going through a heated tube. The temperature of this tube is undoubtedly the most critical parameter when optimizing detection. If the temperature is too high, semi-volatile or thermally labile compounds in the sample may evaporate or decompose and will not be detected. Most of our competitors' ELSD systems do not select droplets and require higher temperatures to reach acceptable levels of noise during the analysis, resulting in much lower sensitivities for semi-volatile and thermo-labile compounds.

SENSITIVITY

FLEXIBILITY

EXPERIENCE

QUALITY CONTROL AND EDUCATIONAL LABORATORIES

SEDEX *LC*
LT-ELSD™

SEDEX Model LC combines sensitivity, reliability, and accuracy for all your analytical works, thanks to unrivalled SEDEX technology.

The SEDEX Model LC detector provides the cost-effective solution in Evaporative Light-Scattering Detection for standard Liquid Chromatography. Control of the system can be done either locally or via a PC. A remote shut down mode is also provided to minimize cost and enhance system lifetime.

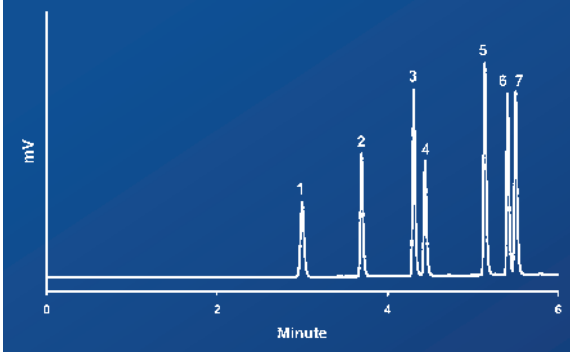
Features and Benefits:

- Optimizes sensitivity of non-volatile, thermally labile and semi-volatile compounds.
- Minimized band broadening thanks to a dedicated SEDEX LC HPLC nebulizer and an innovative cell design. This nebulizer covers the flow rate range from 200µL/min to 2mL/min and can be easily mounted and dismounted.
- With **SAGA** (**S**EDEX **A**utomated **G**ain **A**djustment)*, an innovative gain control available when it is driver-controlled by software, SEDEX LC automatically adapts the gain setting to avoid any off-scale saturation of the detector.
- Complete Remote Control: the gas, heater, photodiode and light source can be automatically shut off at the end of a series of analyses.

Typical Application: Natural Products

Many natural products such as herbal drugs are gaining more and more interest in the pharmaceutical and nutraceutical industry because they contain bioactive compounds. Some of these compounds such as saponins and terpenes do not possess any chromophore and therefore cannot be analyzed in HPLC using a UV detector. Only SEDEX ELSD can detect chromophoric and non-chromophoric molecules in a single gradient HPLC analysis with an excellent sensitivity, thanks to SEDEX technology. The following example shows a method for a quick and simultaneous determination of terpenic lactones and flavonoids present in Ginkgo Biloba.

CHROMATOGRAM OF FOUR TERPENIC LACTONES AND THREE FLAVONOIDS BY HPLC/ELSD



1 - Bilobalide,
2 - Ginkgolide C,
3 - Ginkgolide A,
4 - Ginkgolide B,
5 - Quercetin,
6 - Isorhamnetin,
7 - Kaempferol

Injection Volume: 1µL

Column: Hypersil Gold (1.9µm, 2.1 x 50mm), 30°C

Eluent: A - 0.1% formic acid in H2O; B - 0.1% formic acid in Acetone

Gradient: 0-0.5 minute: 5%B, 0.5-4 minutes: from 5%B to 50%B, 4-6 minutes: 50%B

Flow Rate: 0.6mL/min

FLEXIBILITY

PURIFICATION WORKS

SEDEX *FP*
LT-ELSD™

SEDEX Model FP combines simplicity, reliability, and robustness for all your purification works, thanks to unrivalled SEDEX technology.

The SEDEX Model FP provides the cost-effective solution in Evaporative Light-Scattering Detection for purification by preparative HPLC, preparative SFC, Flash Chromatography or CounterCurrent Chromatography. Control of the system can be done either locally or via a PC. A remote shut down mode is also provided to minimize cost and enhance system lifetime.

Sophisticated, yet easy to use, SEDEX FP, mounted with an external splitter, is ready to detect and monitor your fraction collection.

Features and Benefits:

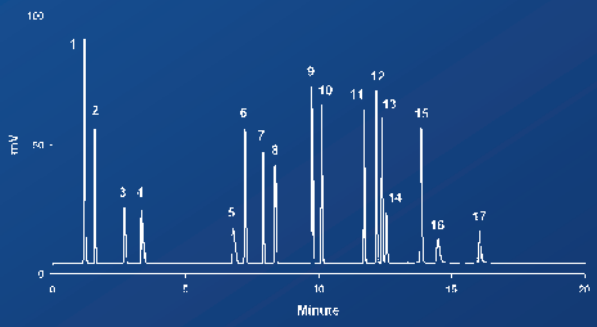
- Minimized band broadening thanks to a dedicated SEDEX FP nebulizer and an innovative cell design. This nebulizer covers the flow rate range from 100µL/min to 5mL/min and can be readily and quickly mounted and dismounted.
- With **SAGA** (**S**EDEX **A**utomated **G**ain **A**djustment)*, an innovative gain control available when it is driver-controlled by software, SEDEX FP automatically adapts the gain setting to avoid any off-scale saturation of the detector.
- An optimized liquid flow path and a Gas-Focusing technology in the optical detection cell prevent the detector from any clogging or contamination, and extend its operability.
- Complete remote control: the gas, heater, photodiode and light source can be automatically shut off at the end of a series of purifications.

Typical Application: Amino acids, peptides, proteins

In protein and peptide "mapping" and purification, where gradient elution is required, SEDEX ELSD has a key advantage over UV detection: it can detect all compounds including single amino acids, its baseline is unperturbed by the mobile phase change during the gradient, and remains flat. As a mass detector, ELSD can also provide a material balance purity assessment.

*patent pending

CHROMATOGRAM OF THE DIRECT AND SIMULTANEOUS HPLC/ELSD ANALYSIS OF EIGHT UNDERIVATIZED AMINO ACIDS, FIVE PEPTIDES AND FOUR PROTEINS



1 - Glycine, 2 - Proline, 3 - Valine, 4 - Methionine,
5 - Leucine, 6 - Tyrosine, 7 - GLY-TYR,
8 - Phenylalanine, 9 - Tryptophan,
10 - VAL-TYR-VAL, 11 - MET-Enkephaline,
12 - Angiotensin II, 13 - Ribonuclease A,
14 - LEU-Enkephalin, 15 - Cytochrome C,
16 - Holo-Transferrin, 17 - Apomyoglobin.

Injection Volume: 2µL

Column: Ascentis Express Peptide ES-C18 (2.7µm, 2.1 x 150mm), 25°C

Eluent: A - 0.1% TFA in H2O; B - 0.1% TFA in Acetonitrile

Gradient: 0-0.5 minute: 2%B,
0.5-15 minutes: from 2%B to 60%B,
15-20 minutes: 60%B

Flow Rate: 0.3mL/min

SENSITIVITY

FLEXIBILITY

EXPERIENCE

QUALITY CONTROL AND EDUCATIONAL LABORATORIES

SEDEX *80LT*

LT-ELSD™

SEDEX Model 80 LT-ELSD combines sensitivity, reliability, and accuracy for your analyses, thanks to the unrivalled SEDEX low-temperature technology.

SEDEX Model 80 LT-ELSD presents a number of innovative features including a unique low-temperature technology, with a competitive price. The evaporation drift tube design optimizes both efficiency and sensitivity. In addition, you can control the system locally or via a PC (with RS-232 activated models) thanks to drivers. A remote shut down mode is also provided to minimize cost and enhance system lifetime.

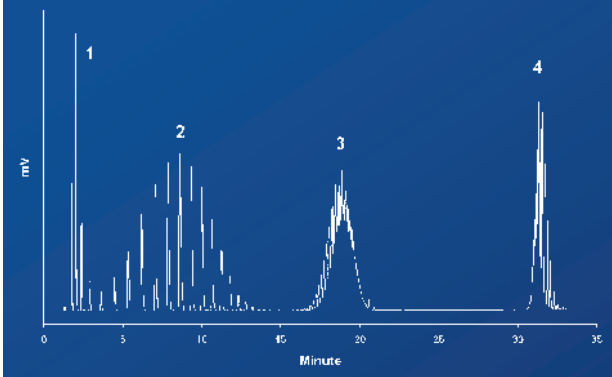
Features and Benefits:

- Low-temperature evaporation of the mobile phase: optimizes sensitivity of thermally labile and semi-volatile compounds.
- Enhanced sensitivity using digital signal treatment: an innovative signal processing algorithm minimizes noise and optimizes sensitivity.
- Minimized band broadening thanks to an innovative cell design and a choice of nebulizers. Two nebulizers, HPLC and Flash Chromatography, are available to optimize your applications. These nebulizers cover the flow rate range from 100µL/min to 5mL/min and can be easily changed to meet your application requirements. In addition, all parts of SEDEX Model 80LT are designed so that the observed peak widths are similar to those obtained with UV/Vis detectors.
- Complete Remote Control: gas, heater, photomultiplier and light source can be automatically switched off at the end of a series of analyses.

Typical Application: Surfactants

The high sensitivity and time saving potential of LT-ELSD™ are evident in the HPLC/ELSD analysis of mixtures of polymers in a single run which is not feasible with alternative methods such as RI, UV and MS detection.

CHROMATOGRAM OF THE SIMULTANEOUS HPLC/ELSD ANALYSIS OF SEVERAL SURFACTANTS



1 - PEG 200,
2 - PEG 600,
3 - PEG 2000,
4 - Triton X100.

Injection Volume: 2µL

Column: Acclaim Surfactant Plus (3µm, 3.0 x 150mm), 30°C

Eluent: A - Ammonium acetate, 100mM, pH5; B - Acetonitrile

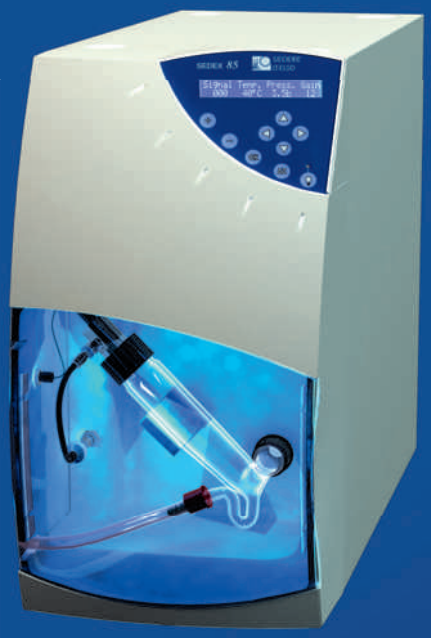
Gradient: 0-0.1 minute: 2%B, 0.1-20 minutes: from 2%B to 20%B, 20-30 minutes: 20%B to 50%B, 30-35 minutes: 50%B

Flow Rate: 0.6mL/min

FLEXIBILITY

HIGH PERFORMANCE AND HIGH THROUGHPUT

SEDEX *85LT*
LT-ELSD™



SEDEX Model 85 LT-ELSD™ combines total remote control with excellent sensitivity and provides the standard solution in Low-Temperature Evaporative Light-Scattering Detection for HPLC, U-HPLC, and SFC.

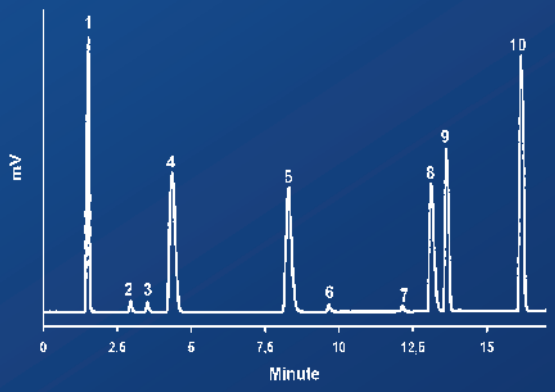
Features and Benefits:

- Low-temperature evaporation of the mobile phase: optimizes sensitivity of thermally labile and semi-volatile compounds.
- Enhanced sensitivity using digital signal treatment: an innovative signal processing algorithm minimizes noise and optimizes sensitivity.
- Minimized band broadening thanks to an innovative cell design and a wide choice of nebulizers. Six nebulizers are available to optimize your applications. Four nebulizers cover the flow rate range from 5µL/min to 5mL/min, additionally there is one nebulizer optimized for U-HPLC and another one specifically for SFC. All these nebulizers can be easily changed to meet the requirement of the application. In addition, all parts of SEDEX Model 85LT are designed to provide the lowest dispersion, so that the observed peak widths are similar to those obtained with the most advanced UV/Vis detectors.
- Complete Remote Control: gas, heater, photomultiplier and light source can be automatically switched off at the end of a series of analyses.

Typical Application: Polar, non-polar, neutral, acidic, basic API and their counterions

The outstanding combination of multimodal columns with a unique detection mode such as LT-ELSD™ can provide simple, direct and simultaneous analyses of active pharmaceutical ingredients of different chemical structures and their respective counterions.

MULTIMODAL STATIONARY PHASE HPLC/ELSD CHROMATOGRAM OF THE SIMULTANEOUS ANALYSIS OF POLAR AND NON-POLAR, NEUTRAL, ACIDIC AND BASIC PHARMACEUTICAL DRUGS AND THEIR COUNTERIONS



1 - Acetaminophen, 2 - Sodium,
3 - Potassium, 4 - Hydrocortisone,
5 - Procainamide, 6 - Chloride, 7 - Nitrate,
8 - Miconazole, 9 - Losartan, 10 - Dichlofenac

Injection Volume: 2µL

Column: Acclaim Trinity P1 (3µm, 2.1 x 150mm), 30°C

Eluent: A - 80% Ammonium acetate 20mM, pH5 / 20% Acetonitrile; B - 30% Ammonium formate 200mM, pH3 / 70% Acetonitrile

Gradient: 0-2 minutes: 0%B, 2-17 minutes: from 0%B to 100%B

Flow Rate: 0.35mL/min

SENSITIVITY

FLEXIBILITY

EXPERIENCE

HIGH PERFORMANCE AND HIGH THROUGHPUT

SEDEX 90LT
LT-ELSD™

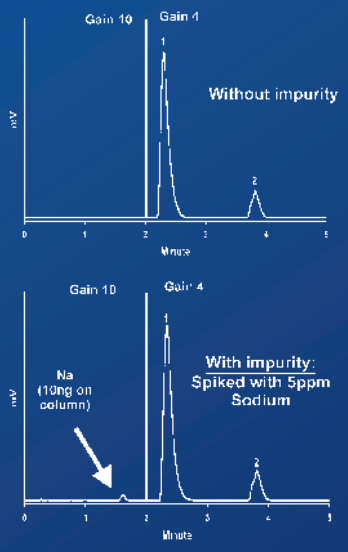
SEDEX Model 90 LT-ELSD combines total remote control with unrivalled sensitivities compared to all other aerosol-based detectors. It provides the ultimate solution in low-temperature evaporative light-scattering detection for HPLC, U-HPLC, and SFC, resulting from a new optical head design based on laser technology. This detector shows a number of innovative features including the ability to select the best nebulizer and a unique low-temperature technology. The evaporation drift tube design optimizes both efficiency and sensitivity. In addition, you can control the system locally or via a PC thanks to drivers. A remote shut down mode is provided to minimize consumable cost and enhance system lifetime.

Features and Benefits:

- Low-temperature evaporation of the mobile phase: optimizes sensitivity of thermally labile and semi-volatile compounds.
- New optical head design based on a selected laser: provides the highest signal-to-noise ratio for all compounds (typical sensitivity down to the mid picogram level on column).
- Enhanced sensitivity using digital signal treatment: an innovative signal processing algorithm minimizes noise and optimizes sensitivity.
- Dynamic range of over four orders of magnitude: enhanced determination of very low percentage of impurities.
- Direct linearity on the global dynamic range: enhanced correlation coefficients.
- Minimized band broadening thanks to an innovative cell design and a wide choice of nebulizers. Six nebulizers are available to optimize your applications. Four nebulizers cover the flow rate range from 5µL/min to 5mL/min, additionally there is one nebulizer optimized for U-HPLC and another one specifically for SFC. All these nebulizers can be readily and quickly changed to meet the requirement of the application. In addition, all parts of SEDEX Model 90LT are designed to provide the lowest dispersion, so that the observed peak widths are similar to those obtained with the most advanced UV/Vis detectors (typically below 1 second in U-HPLC).
- Complete Remote Control: gas, heater, photomultiplier and light source can be automatically switched off at the end of a series of analyses.

CHROMATOGRAMS OF THE SIMULTANEOUS HPLC/ELSD ANALYSIS OF IMIPRAMINE AND ITS COUNTERION, WITH AND WITHOUT AN IMPURITY (SODIUM, 5PPM)

1- Impurity assessment



1 - Imipramine (API: 10 000ppm),
2 - Cl (Counterion)

Injection Volume: 2µL (20µg Imipramine, 10ng Sodium on column)

Column: Acclaim Trinity P1 (3µm, 2.1 x 150mm), 35°C

Eluent: Ammonium acetate 50mM, pH5 / Acetonitrile (60:40)

Flow Rate: 0.5mL/min

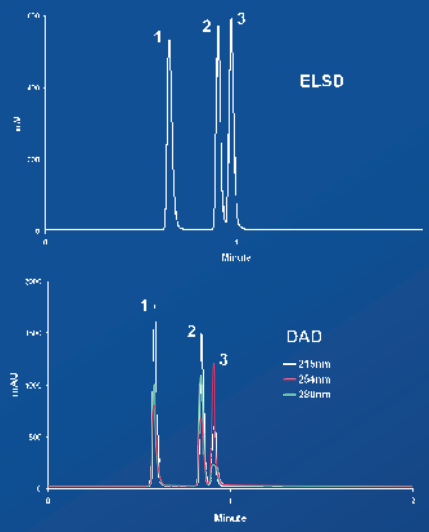
FLEXIBILITY

Typical Applications: Impurity assessment and response consistency

Aerosol-based detectors are very useful to pharmaceutical analysis, particularly those which provide the best sensitivity and reproducibility, a wide dynamic range, a correct direct linearity and response consistency, and which can suit both conventional HPLC and U-HPLC. SEDEX Model 90 LT-ELSD meets perfectly well these requirements. As an example, two case studies are presented on impurity assessment and response consistency.

Chromatogram of the fast HPLC/ELSD/DAD analysis of three pharmaceutical drugs

2 - Response consistency



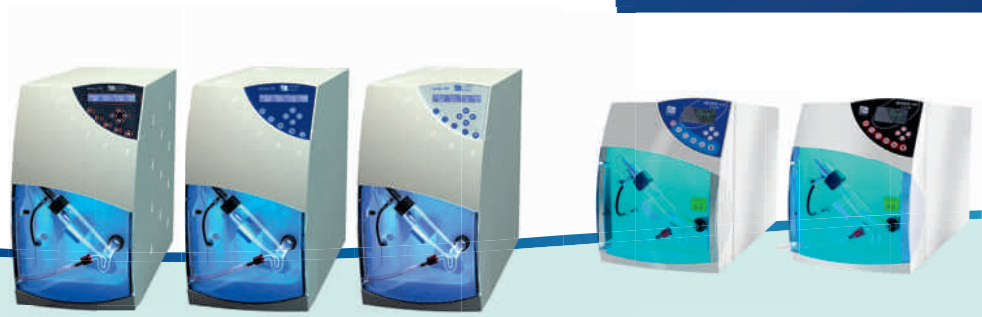
1 - 5-Fluorocytosine,
2 - Theophylline,
3 - Acetaminophen, (500ppm each)

Injection Volume: 2µL

Column: Halo C18 (2.7µm, 2.1 x 150mm), 30°C

Eluent: H2O / Acetonitrile (85:15)

Flow Rate: 0.5mL/min



SEDEX Drivers

SEDEX ELS detectors are designed to integrate into any LC or SFC system, from any manufacturer. They can also be directly controlled and data collected via drivers with the following major chromatography software:

- OpenLAB® (ChemStation and EZChrom editions)
- ChemStation®
- EZChrom®
- Chromeleon®
- Xcalibur®
- Clarity®

SENSITIVITY

FLEXIBILITY

EXPERIENCE

CASE STUDIES:

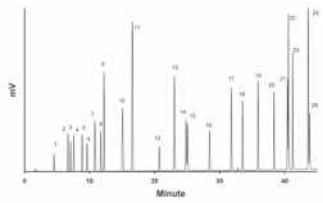
CASE 1
LIPIDS

LT-ELSD™ solves the major problems common to other HPLC detectors: lack of sensitivity, incompatibility with multi-solvent gradients. This state-of-the-art technique is ideally suited to non-chromophoric compounds, such as lipids and phospholipids.

LT-ELSD™ is also highly useful where the mobile phase contains a chromophore, such as Acetone, which blanks out the UV detector.

Injection Volume: 2µL
Column: Hypersil GOLD (1.9µm, 2.1 x 200mm), 60°C
Eluent: A - MeOH/ACN/H2O/Formic acid (500:300:198:2); B - MeOH/Acetone/Formic acid (598:400:2)
Gradient: 0-3 minutes: 100%A, 3-43 minutes: from 100%A to 100%B
Flow Rate: 0.3mL/min

Chromatogram of the simultaneous HPLC/ELSD analysis of fatty acids, fatty alcohols, fat-soluble vitamins, mono-, di- and triglycerides and related compounds



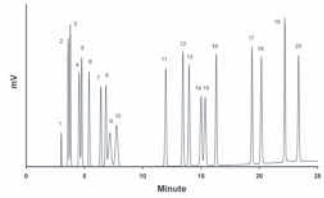
1 - Lauric acid,
2 - Linolenic acid,
3 - Myristic acid,
4 - Retinol (Vit. A),
5 - Linoleic acid,
6 - Monolein,
7 - Palmitic acid,
8 - Oleic acid,
9 - Hexadecanol,
10 - Stearic acid,
11 - Octadecanol,
12 - Eicosanol,
13 - Cholesterol,
14 - Docosanol,
15 - a-Tocopherol (Vit. E),
16 - Phylloquinone (Vit. K1),
17 - Squalene,
18 - Diolein,
19 - Trilaurin,
20 - Trilinolenin,
21 - Trimyristin,
22 - Coenzyme Q10,
23 - Trilinolein,
24 - Tripalmitin,
25 - Triolein

CASE 2
CARBOHYDRATES

Unlike RI Detection, LT-ELSD™ allows gradient elution. Gradient elution provides increased resolution of sugars in minimal time, impossible with RI and isocratic elution. Moreover, lower detectable limits (sensitivity) can be improved by orders of magnitude. Nanomole and picomole detectability are obtained with the improved sensitivity of LT-ELSD™. Mono-, oligosaccharides and polyols are easily and rapidly characterized by gradient HPLC with LT-ELSD™. Previously, RI detection entailed slow and tedious programmed flow, often up to several hours. LT-ELSD™ also enables analysis of high "DPs" which is an important advantage.

Injection Volume: 2µL
Column: Imtakt UK-Amino (3µm, 3.0 x 250mm), 60°C
Eluent: A - H2O; B - Acetonitrile
Gradient: 0-6 minutes: 10%A, 6-20 minutes: from 10%A to 25%A, 20-25 minutes: 25%A
Flow Rate: 0.7mL/min

Chromatogram of the simultaneous HPLC/ELSD analysis of polyols, mono-, di- and oligoholosides



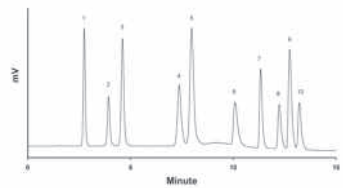
1 - Glycerol,
2 - Rhamnose,
3 - Erythritol,
4 - Arabinose,
5 - Xylose,
6 - Fructose,
7 - Sorbitol,
8 - Mannose,
9 - Galactose,
10 - Glucose,
11 - Inositol,
12 - Sucrose,
13 - Maltulose,
14 - Lactose,
15 - Maltose,
16 - Trehalose,
17 - Raffinose,
18 - Maltotriose,
19 - Nystose,
20 - Maltotetraose

CASE 3
INORGANIC IONS

LT-ELSD™ can dramatically simplify the analysis of inorganic ions in aqueous samples. A broad range of volatile buffers can be used to separate the ions. Since the mobile phase and buffers are vaporized before the ions are detected, the need for ion suppression is eliminated. This example shows a generic method to determine rapidly and simultaneously inorganic cations and anions.

Injection Volume: 2µL
Column: ZIC-HILIC (3.5µm, 2.1 x 150mm), 40°C
Eluent: A - Ammonium formate 20mM, pH3; B - Acetonitrile
Gradient: 0-3 minutes: 20%A, 3-10 minutes: from 20%A to 80%A, 10-15 minutes: 80%A
Flow Rate: 0.3mL/min

Chromatogram of the simultaneous HILIC/ELSD analysis of inorganic anions and cations



1 - NO3,
2 - Br,
3 - Cl,
4 - K,
5 - Na,
6 - PO4,
7 - SO4,
8 - Zn,
9 - Mg,
10 - Ca

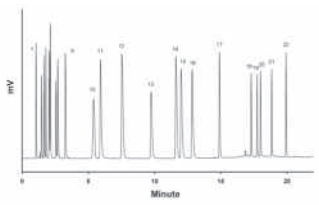
CASE 4

UNDERIVATIZED AMINO ACIDS

Analysis of amino acids has typically been complicated by the absence of adequate chromophores in naturally occurring amino acids. Using LT-ELSD™, sensitivity is excellent, with detection limits as low as 2ng on column. In this study, twenty two amino acids have been separated and quantified within 20min without any sample preparation step for derivatization.

Injection Volume: 2µL
Column: Zorbax SB-C18 (1.8µm, 2.1 x 150mm), 40°C
Eluent: A - H2O + (0.5% TFA, 0.3% HFBA); B - Acetonitrile
Gradient: 0-3 minutes: 100%A, 3-10 minutes: from 0%B to 5%B, 10-20 minutes: from 5%B to 35%B
Flow Rate: 0.3mL/min

Chromatogram of the HPLC/ELSD analysis of underivatized amino acids



1 - Taurine,
2 - Glycine,
3 - Aspartic acid,
4 - Glutamine,
5 - Glutamic acid,
6 - Threonine,
7 - GABA,
8 - Cysteine,
9 - Ornithine,
10 - Lysine,
11 - Proline,
12 - Histidine,
13 - Theanine,
14 - Arginine,
15 - Valine,
16 - Methionine,
17 - Tyrosine,
18 - Isoleucine,
19 - Leucine,
20 - Norleucine,
21 - Phenylalanine,
22 - Tryptophan

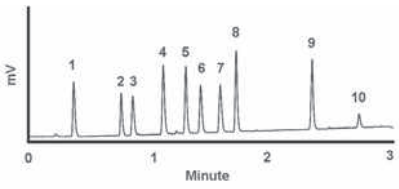
CASE 5

U-HPLC

The pharmaceutical discovery environment requires an increasing number of rapid high-throughput methods such as U-HPLC to determine the identity, purity, and quantity of small molecules. In this regard, the powerful and versatile LT-ELSD™ is the detector of choice because of its universality, high sensitivity, and optimized technology which provides the smallest peak widths, the best symmetry, and high data rate. This example shows an application which combines an ultra-fast liquid chromatography system with LT-ELSD™, to determine chromophoric and non-chromophoric compounds such as artesunate used as an antimalaric drug.

Injection Volume: 5µL
Column: Acquity BEH C18 (1.7µm, 2.1 x 50mm), 25°C
Eluent: A - 0.1% formic acid in H2O; B - 0.1% formic acid in Acetonitrile
Gradient: 0 minute: 6%B, 0-3.1 minutes: from 6%B to 56%B
Flow Rate: 0.5mL/min

Chromatogram of the U-HPLC/ELSD analysis of ten active pharmaceutical ingredients



(Courtesy of Dr. Davy Guillarme, University of Geneva, Switzerland)

1 - Sulfanilamide,
2 - Caffeine,
3 - Chloroprocaine,
4 - Acebutolol,
5 - Sulfamethoxazole,
6 - Noscapine,
7 - Propanolol,
8 - Hydrocortisone,
9 - Ketoprofen,
10 - Artesunate

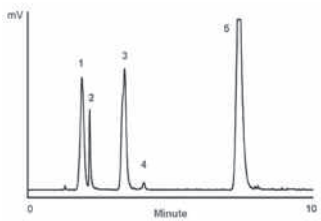
CASE 6

SFC

Supercritical Fluid Chromatography is gaining an increasing interest. It presents many advantages compared to other chromatography techniques and it has emerged as a powerful « green » technology in industries such as pharmaceutical, agricultural, food and environmental, etc. The following example demonstrates that the combination of SFC / LT-ELSD™ provides a much simpler and quicker relevant alternative to Gas Chromatography for the fast screening of impurities in Biodiesel.

Injection Volume: 5µL
Column: Diol (5µm, 4.6 x 250mm)
Eluent: CO2 / Ethanol (isocratic, 95:5); P (out) = 15MPa
Flow Rate: 3mL/min

Chromatogram of SFC/ELSD analysis of ASTM D6584 standard for biodiesel quality determination



(Courtesy of Dr. Eric Lesellier, University of Orléans, France)

1 - Triolein,
2 - Pyridine (standard sample solvent),
3 - 1,3 Diolein,
4 - Glycerol,
5 - Monolein

SPECIFICATIONS	SEDEX 90LT	SEDEX 85LT	SEDEX 80LT	SEDEX LC	SEDEX FP
COMPONENTS					
Detection	Photomultiplier (PMT)	Photomultiplier (PMT)	Photomultiplier (PMT)	Photodiode	Photodiode
Light Source	10mW - 405nm Laser Elapsed Time Counter	Blue LED Elapsed Time Counter	Blue LED Elapsed Time Counter	Blue LED Elapsed Time Counter	Blue LED Elapsed Time Counter
Temperature Range	Ambient to 100°C				
Nebulizers	HPLC, Low Flow, Micro, CC, U-HPLC, SFC	HPLC, Low Flow, Micro, CC, U-HPLC, SFC	HPLC, Flash	LC	Flash
Eluent Flow Rate	5µL/min to 5mL/min	5µL/min to 5mL/min	100µL/min to 5mL/min	200µL/min to 2mL/min	100µL/min to 5mL/min
Typical Sensitivity	500pg	1ng	5ng	5ng	100ng
DATA					
Analog Output	0 - 1 Volt				
Gain Settings	1 to 12 - Factor 2^{11} (2048)	1 to 12 - Factor 2^{11} (2048)	1 to 12 - Factor 2^{11} (2048)	1 to 7	1 to 8
Filter	Moving Average (0 - 0.5 - 1 - 2 .... 10)	Moving Average (0 - 0.5 - 1 - 2 .... 10)	Moving Average (0 - 0.5 - 1 - 2 .... 10)	Dedicated Numerical Algorithm	Moving Average (0 - 0.5 - 1 - 2 .... 10)
Signal Amplification				SAGA (SEDEX Automated Gain Adjustment)*	SAGA (SEDEX Automated Gain Adjustment)*
Data Rate	100Hz	100Hz	40Hz	40Hz	10Hz
COMMUNICATION					
Display and Selection	Liquid Crystal Display and Keypad	Liquid Crystal Display and Keypad	Liquid Crystal Display and Keypad	OLED Display and Keypad	OLED Display and Keypad
Events	Contact Closure, TTL for Ready, Autozero				
Powerdown Methods	Shut-off: Gas, Light Source, Heating and/or PMT Cleaning Mode	Shut-off: Gas, Light Source, Heating and/or PMT Cleaning Mode	Shut-off: Gas, Light Source, Heating and/or PMT Cleaning Mode	Shut-off: Gas, Light Source, Heating and/or Photodiode Cleaning Mode	Shut-off: Gas, Light Source, Heating and/or Photodiode Cleaning Mode
Computer Interface	USB, RS-232	RS-232	RS-232 (option)	USB, RS-232	USB, RS-232
Software	Drivers (option)				
EXTERNAL REQUIREMENTS					
Power	230V/50Hz or 115V/60Hz	230V/50Hz or 115V/60Hz	230V/50Hz or 115V/60Hz	100V to 240V (50Hz/60Hz)	100V to 240V (50Hz/60Hz)
Gas Supply	Nitrogen or Air 3.5bar (less than 3L/min)	Nitrogen or Air 3.5bar (less than 3L/min)	Nitrogen or Air 3.5bar (less than 3L/min)	Nitrogen or Air 3.5bar (less than 3L/min)	Nitrogen or Air 2.0bar (less than 3L/min)
Dimensions	250mm (10in) W 480mm (19in) H 550mm (22in) D	250mm (10in) W 480mm (19in) H 550mm (22in) D	250mm (10in) W 480mm (19in) H 550mm (22in) D	250mm (10in) W 330mm (13in) H 530mm (21in) D	250mm (10in) W 330mm (13in) H 530mm (21in) D
Weight	18.5kg (41lb)	18.5kg (41lb)	18.5kg (41lb)	15kg (33lb)	15kg (33lb)

Specifications are subject to change as part of our ongoing product improvement program.

*patent pending

SEDERE is committed to user satisfaction with every SEDEX detector, and provides you with:

- A Worldwide distribution network at your service.
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- Full SOP (Standard Operating Procedures) including IQ, OQ, PQ.
- Technical and applications support.
- Web-access to applications in many fields.
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EXPERIENCE

SEDEX LT-ELSD™

An Industry Standard for Evaporative Light-Scattering Detection

"The arrival of the Ultra Fast HPLC has fueled the demand for technology capable of both qualitative and quantitative analysis of complex mixtures at high speed. SEDEX LT-ELSD™ technology has been validated by extensive applications within the drug discovery, pharmaceutical and nutraceutical industries. SEDEX detectors are used in every major pharmaceutical company and in hundreds of biotechnology laboratories in industry and universities.

For many research and process requirements, complementary detection by SEDEX LT-ELSD™ has proven indispensable to high quality LC/MS and other HPLC procedures. SEDEX LT-ELSD™ is particularly valuable for effective compound library screening, where sample characterization may be incomplete. With other ELS detectors, volatilization could limit the detection capability of the platform, resulting in loss of vital data.

By combining reliability and sensitivity, SEDEX detectors have taken their place in the armamentarium of excellent techniques for medicinal chemistry."

"The integration of the SEDERE ELSD in our preparative chromatography system was very fast and easy. This detector has proven to be a valuable solution for our customers who want to collect non-UV absorbing compounds. Thanks to its simplicity of use and its robustness this ELSD doesn't require any particular expertise from the user. It can really be integrated in any preparative chromatography system as an easy and affordable "universal" detector."

Brigitte Pichon Ph.D.
Product Group Manager
Prep. Chromatography & Melting Point
BÜCHI Labortechnik AG

ORDERING INFORMATION

Standalone Units	115 V	230 V
SEDEX 90 LT-ELSD™		
HPLC Version	90001	90000
UHPLC Version	90901	90900
SEDEX 85 LT-ELSD™		
HPLC Version	85001	85000
UHPLC Version	85901	85900
Low Flow Version	85301	85300
Micro LC Version	85601	85600
SFC Version	85501	85500
SEDEX 80 LT-ELSD™		
HPLC Version (RS232 activated)	80001S	80000S
SEDEX LC		
Standalone Version	50000	
SEDEX FP		
Standalone Version	40000	

EXPERIENCE

In our laboratory at the University of Geneva, we are using SEDEX LT-ELSD technology for more than 20 years, as a complementary tool to UV detection and to develop LC-MS friendly procedures since the prerequisite concerning the nature of the mobile phase is similar. We have a long-term collaboration with the manufacturer, SEDERE, to demonstrate the interest of such detector in the pharmaceutical field. Their latest product, namely SEDEX 90LT is more sensitive than the previous generation and still robust, reliable, easy-to-use and almost universal.

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Professor & Senior lecturer
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