Corona CAD Charged Aerosol Detector

Know what is really in your sample

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Meaningful Answers from One HPLC Detector

What is the best way to detect and quantify analytes with HPLC? There is no simple answer. UV detection is the most widely used, but fails to detect analytes without chromophores. Other, so-called "universal detectors" have fallen short of the promise of combining application versatility with reliability. For many, MS is not the answer.

Now there is a solution – the Corona® Charged Aerosol Detector (CAD®).

Based on a unique and innovative detection method, the Corona CAD detector offers performance that refractive index (RI), low wavelength UV, evaporative light scattering (ELS), and chemiluminescence nitrogen (CLN) detectors simply cannot match. With charged aerosol detection, you can know what's really in your sample. The Corona CAD delivers:

- Response independent of chemical structure
- Sensitivity to low nanograms
- Gradient compatibility
- Wide dynamic range
- Simple operation

Ideal for a wide range of applications

The Corona CAD is appropriate for any nonvolatile and many semivolatile compounds, including:

- Pharmaceuticals
- Proteins
- Lipids
- Steroids
- Oligosaccharides
- Surfactants
- Carbohydrates
- Polymers
- Counterions
- Peptides

Integration with any HPLC system

The Corona CAD can be used with any standard HPLC system. Software drivers are available for Chromeleon® Chromatography Data System, ChemStation®, EZChrom®, and Empower® 2.
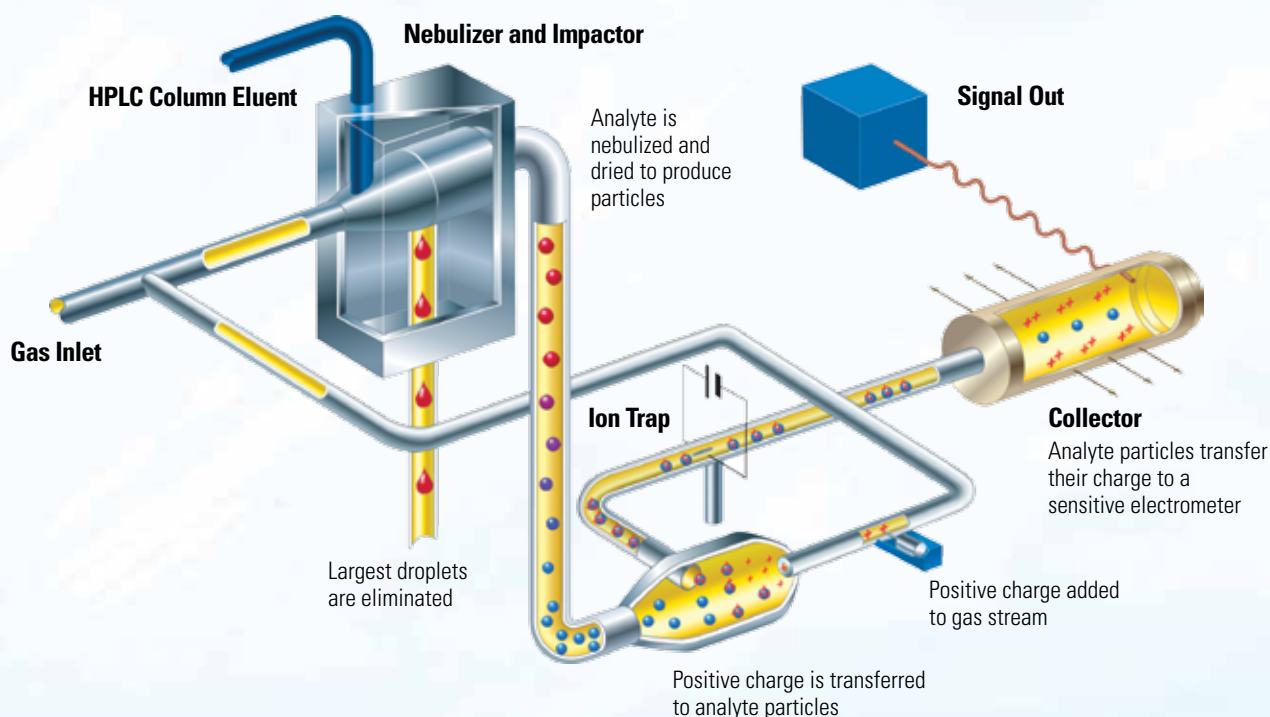
The Corona CAD is highly versatile, allowing easy integration with existing instrumentation to support a wide range of information-rich applications.

How Charged Aerosol Detection Works

Charged Aerosol Detection

What makes any detector useful is its ability to accurately measure a wide range of analytes with consistent response. However, most detectors exhibit limitations. Often, one analyte responds more strongly than another, or may not respond at all.

The Corona CAD detector measures charge that is imparted to analyte particles, with the charge being in direct proportion to the amount of the analyte in the sample. Measuring this charge is accurate and consistent, regardless of the analyte. The result is that the Corona CAD detector can quantify any nonvolatile analyte—this includes those without chromophores or those that do not ionize—thus providing a consistent response that is independent of chemical structure. With charged aerosol detection, you can even measure many semivolatile analytes.

Nebulizer and Impactor

HPLC Column Eluent

Signal Out

Analyte is nebulized and dried to produce particles

Gas Inlet

Ion Trap

Collector
Analyte particles transfer their charge to a sensitive electrometer

Largest droplets are eliminated

Positive charge added to gas stream

Positive charge is transferred to analyte particles

Simplicity in Operation

Step One

Charged aerosol detection begins by converting the eluent into droplets which are subsequently dried, forming particles. The particle size increases with the amount of analyte.

Step Two

A stream of positively charged gas collides with the analyte particles. The charge is then transferred to the particles–the larger the particles, the greater the charge.

Step Three

The particle charge is then transferred to a collector where the charge is measured by a highly sensitive electrometer. This generates a signal in direct proportion to the quantity of analyte present.

Consistent Response with Low Limits of Detection

Consistent Response

The response obtained with the Corona CAD for nonvolatile analytes is less dependent on chemical structure than other detectors. As shown in the figure, charged aerosol detection response by flow injection analysis is very similar for equivalent amounts of a wide diversity of structures. Charged aerosol detection response does not depend on analyte optical properties as with UV, or the ability to ionize, as with MS. This characteristic provides significant advantages for a wide range of quantitative methods.
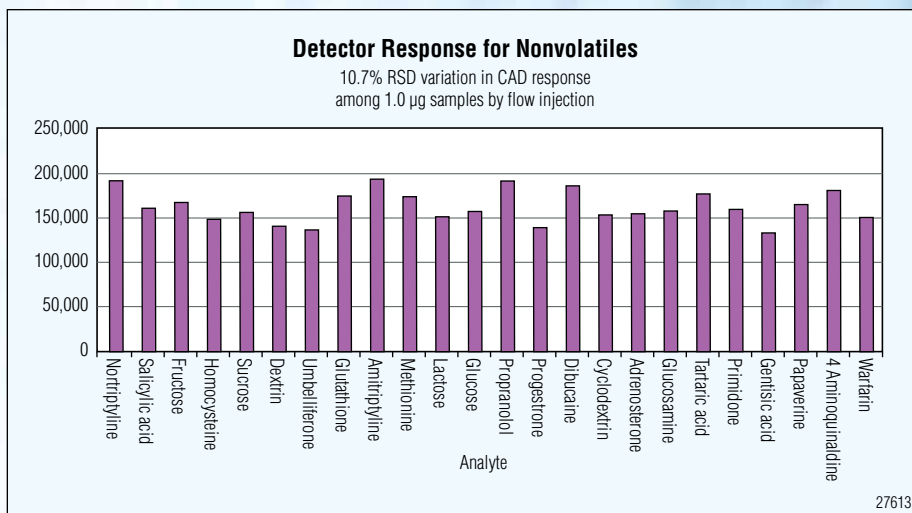
Broad Applicability

The Corona CAD detector provides the ability to measure virtually any nonvolatile and many semivolatile analytes: from proteins, lipids, and oligosaccharides, to amino acids, drugs, and ions.

Positive, negative, or neutral, with or without a chromophore, all can be detected routinely with charged aerosol detection.

Sensitivity

Charged aerosol detection consistently provides high sensitivity with low limits of detection for a wide range of analytes, irrespective of their chemical structure. The Corona CAD can readily detect compounds present in single digit nanogram quantities. Here, 10 nanograms each of four carbohydrates are easily detected, well above the detection limit.

Detector Response for Nonvolatiles
10.7% RSD variation in CAD response
among 1.0 µg samples by flow injection

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Characteristics	Examples
High MW	Albumin, Dextrin
Neutral, nonpola	Estradiol, Umbelliferone, Naphthol
Neutral, polar	Glucose, Fructose, Lactose, Sucrose
Acidic	Salicylic Acid
Basic	Propranolol, Nortriptyline, Amitriptyline, Caffeine
Zwitterionic	Homocysteine, Methionine, Glutathione
Ions	Anions, Cations

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Enhanced Performance

Gradient Compatibility

The Corona CAD detector is fully compatible with gradient operation. Volatile mobile phases such as those used with MS are appropriate for use with the Corona CAD. The figure shows a five minute linear gradient from 10 mM ammonium acetate/2% IPA in H_2O to 10 mM ammonium acetate in 75% ACN/25% MeOH. In the example, note the increased nebulization efficiency with increased organic solvent observed during a reversed phase gradient.
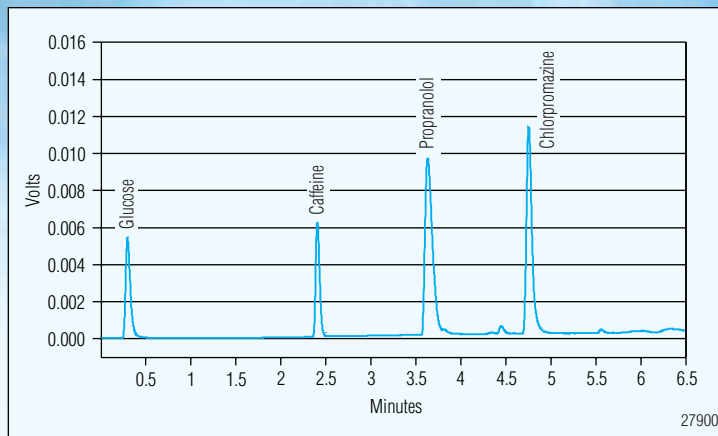

Wide Dynamic Range

Corona CAD's unique method of detection allows quantitation across a range that exceeds four orders of magnitude. The detector's wide dynamic range provides significant advantages for measurements of an analyte and low level impurities in a single run. This dynamic range (low ng to high µg) closely matches the requirements for typical HPLC methods.
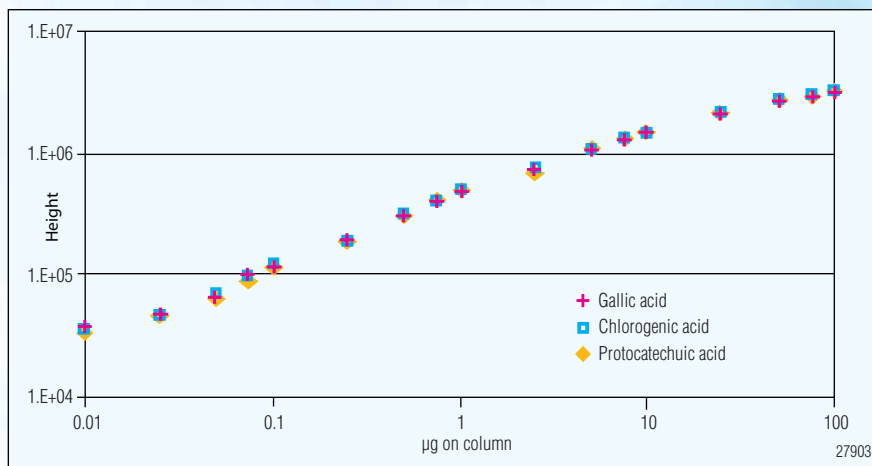
Reproducibility

The Corona CAD offers consistent and reproducible performance. The detector attains excellent precision, making it practical for routine analysis in the QC environment.

At the right are overlaid results of replicate injections of five triglycerides with a RSD of 1.6% to 4.4%. RSD of 2% are typical, with lower results often achieved.
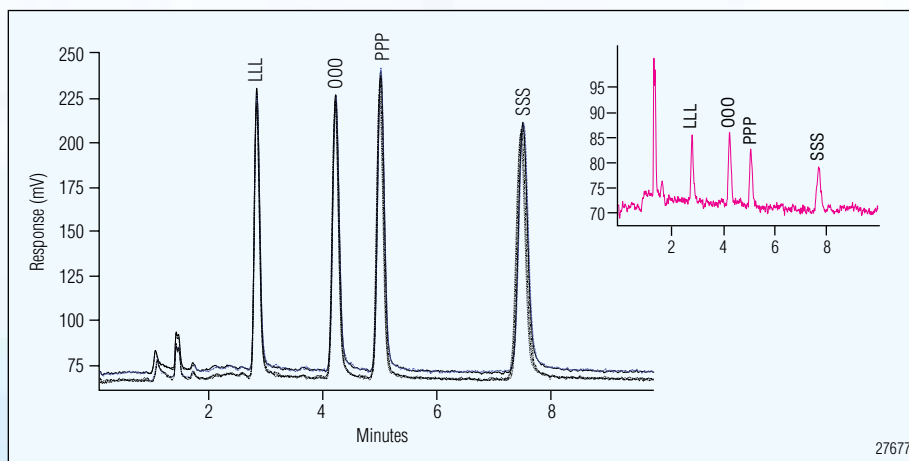
Superior Performance for your Applications

Challenging to Detect

Detection and quantitation of an API and counterions can be a problem. With the Corona CAD and the Acclaim® Trinity™ P1 column, API and counterions (anions and cations) can be measured simultaneously. This means greater efficiency and more robust methods.

Challenging to Quantitate

Trace impurities can be difficult to assess. Often impurities (e.g., degradants, trace residues) have no chromophore and are not detectable with UV. To accurately measure trace impurity levels, high sensitivity and a wide dynamic range are required. With sensitivity to low nanograms and over 4 orders of magnitude dynamic range, the Corona CAD is ideal for trace impurity detection or the trace levels found in cleaning validation. Detection of impurities of 0.005% along with the parent compound are routinely achievable.

Complementary and Orthogonal Data

The Corona CAD's unique method of detection produces data complementary to that of UV and MS. When three detectors are used to analyze the same sample, all respond based on distinctly different physicochemical properties, providing truly orthogonal data. MS only detected two of the three species. With the Corona CAD, three peaks with similar responses were observed – you not only see what you think is in your sample, but what is actually there.

API and Counterions

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Comparison of Charged Aerosol Detection to UV and MS

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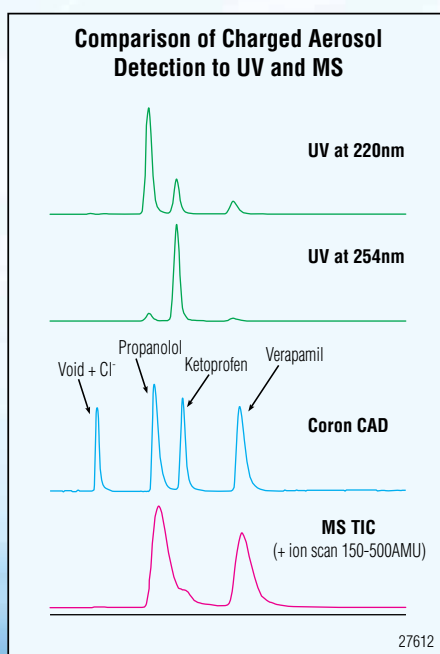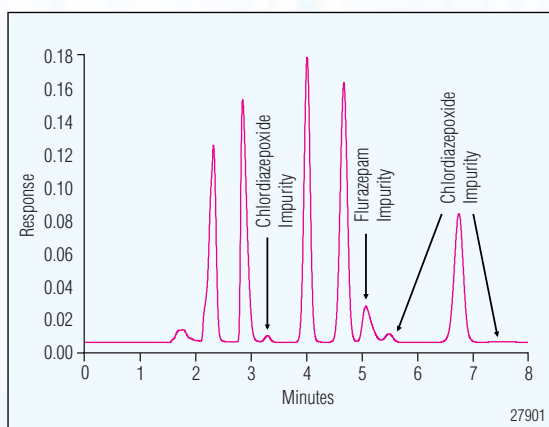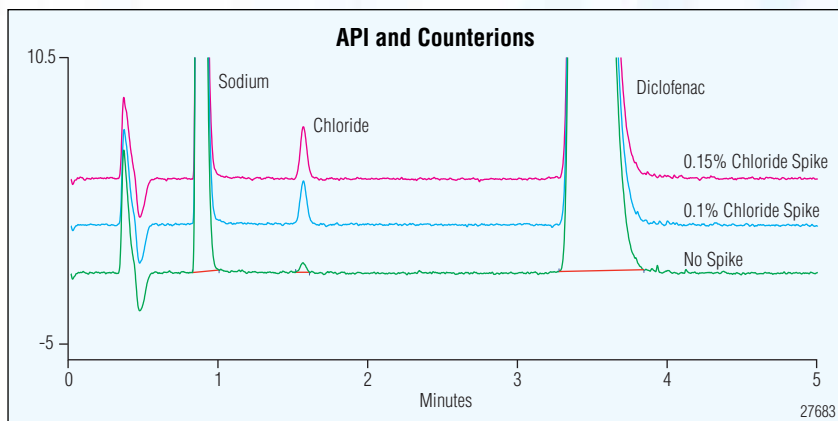
Quick start-up, easy operation

Compatible and versatile
Integrates easily with any HPLC system.

Easy to read display
Brilliant, high contrast readout provides all essential information.

Simple to operate
Set gain and gas flow, and you are up and running.

Soft key operation
Robust, intuitive keypad design.

Gas flow control
Touchpad control with LED status indicator.

Programmable
Store 25 methods. Recall and launch methods easily. Change gain on the fly. Select from 3 preset filters.

Flexibility
Run from the keypad or control the Corona CAD from your PC.

Security
Built-in security features help ensure 21 CFR Part 11 compliance.

Display:
```
MAIN   CORONA   MENU
Select desired operation
[SYSTEM]        [EDIT]    [RUN]
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GAS ON/OFF · EVENT MARK · REMOTE · 7 8 9 4 5 6 1 2 3 0 ± HELP · ENTER · ESCAPE · AUTO ZERO · SECURITY

The Value of Support and Service
Dionex customer care continues after delivery—you get a partner, not just a detector. Dionex provides access to quality post-installation programs and assistance, including timely and professional service by locally based representatives, expert customer training, comprehensive service agreements, and validation and qualification services, as well as application support. Your success equals our success.

Discover Charged Aerosol Detection

In the world of HPLC, one detection technology stands out. Charged aerosol detection has response independent of analyte structure, provides consistent responses across a range of nonvolatile analytes, has a wide dynamic range, broad applicability, and is as easy to use as UV.

Enjoy Industry-Leading Support

Dionex customer Support Centers are located in the Americas, Europe and Asia and provide accessible locations for advanced training and enhanced application development capabilities. Users can visit these laboratories to learn new skills in addressing challenging applications, receive training and support, and discover new, innovative LC and sample preparations solutions.

ISO 9001 REGISTERED

Dionex products are designed, developed, and manufactured under an ISO 9001 Quality System.

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