AEROSOL
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THE MOST ADVANCED LABORATORY INSTRUMENT FOR ORGANIC CARBON, ELEMENTAL CARBON AND BROWN CARBON

DRI 2015

SERIES 2

KEY FEATURES

- 7λ, 405 – 980 nm
- Multi-wavelength measurement of transmission (T) and reflectance (R) intensities
- Brown Carbon (BrC) characterization and software
- Autoloader for 50 samples
- High sensitivity (HS) module
- Coupling to mass spectrometer

KEY BENEFITS

- Efficient and reliable analysis
- Complete quantification of carbonaceous aerosol including Brown Carbon
- Enhancing knowledge for monitoring, climate and health studies
- Unmatched understanding of air pollution sources and impacts

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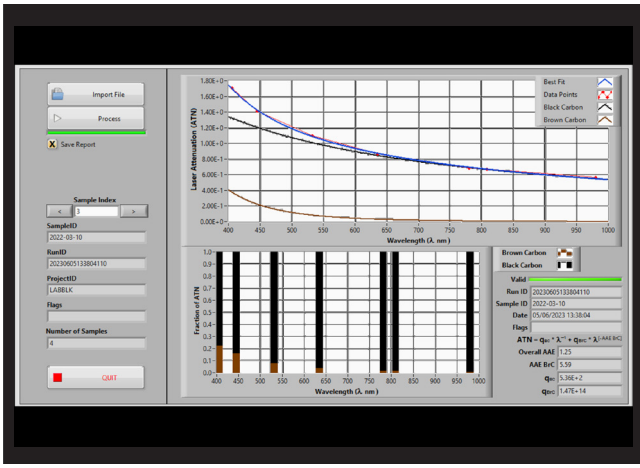
The most advanced instrument for the characterization of the carbonaceous component of aerosol samples collected on filters.

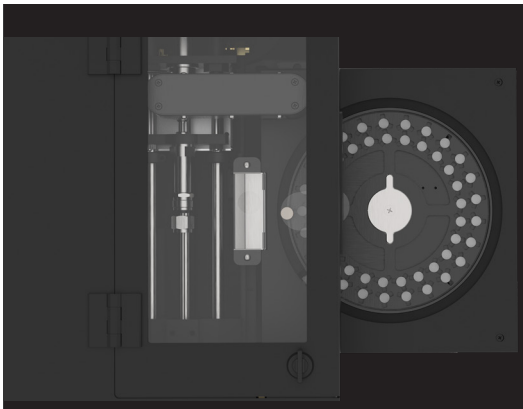
The DRI 2015 Series 2 multi-wavelength carbon analyzer adds significant value to current aerosol monitoring programs, climate, and health studies. It provides detailed measurements of organic carbon, elemental carbon and Brown Carbon.

TO MEASURE IS TO KNOW.



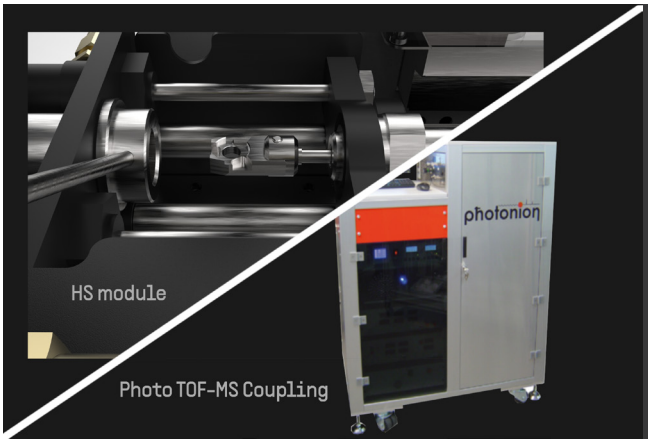
7λ MEASUREMENTS FOR BROWN CARBON ANALYSIS

In a sequence of multiple temperature fractions, the DRI 2015 Series 2 quantifies organic carbon (OC) and elemental carbon (EC, closely related to Black Carbon [BC]). It monitors both the optical transmittance and optical reflectance of the sample simultaneously at 7 wavelengths. These optical signals correct the thermal analysis for the effects of pyrolysis and allow for apportionment in terms of Brown Carbon (BrC), a type of organic carbon aerosol and an indicator of biomass combustion.



AUTOLOADER UNIT FOR LONG AUTONOMY

Autoloader of the DRI 2015 Series 2 with capacity for 50 preloaded samples offers fully automated operation for more than 24 hours. The autoloader unit also encloses the state of the art cooling system and overpressurized holder chamber for longer sample life-time under ambiental conditions and prevents filter contamination. DRI 2015 series 2 with autoloader unit is equipped with easy to use software to control the instrument and to enable time efficient and reliable OC/EC analysis.



ENHANCED FEATURES

The optional high sensitivity (HS) module with the triple sample area size improves minimum detection limit.

DRI 2015 Series 2 coupled with Photonion's mass spectrometer Photo-TOF-MS offers a new powerful analysis of quartz fibre filter samples for bulk carbonaceous particulate matter PM constituents and chemical speciation to the molecular level without sample preparation.

APPLICATIONS

The DRI 2015 Series 2 provides laboratory quantitation, and speciation of Organic Carbon, Elemental Carbon and Brown Carbon and is the best instrument for:

- Detailed ambient air quality monitoring
- Climate research
- Public and occupational health study
- Marine and air transport pollution monitoring
- Particulate matter speciation trends
- Particulate matter source apportionment
- Carbonaceous material analysis

ABOUT DRI 2015 SERIES 2

The Aerosol Magee Scientific multi-wavelength thermal/optical carbon analyzer is a highly sophisticated laboratory instrument providing the most advanced and complete analysis of carbonaceous aerosol particles previously collected on filters: usually either from the atmosphere or directly from sources.

BASIC DESCRIPTION

DRI 2015 Series 2 replaces the widely used DRI Model 2001, and DRI Model 2015 for quantifying organic carbon (OC), elemental carbon (EC, also termed Black Carbon [BC]), and temperature-separated carbon fractions on aerosol filter deposits.

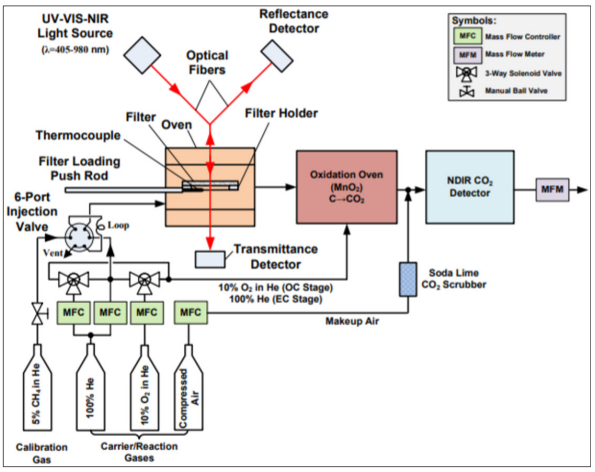
DRI 2015 Series 2 offers major improvements in terms of reliability, operation, maintenance, state-of-the-art components and much shorter analysis time; while maintaining class-leading performance for characterization of carbonaceous aerosols. Improvements in the Series 2 model include upgrades to the oxidation and sample oven system, CO_2 sensor, several mechanical and electronic components, and software.

DRI 2015 Series 2 features optical monitoring that accounts for OC charring with reflected (R) and transmitted (T) intensities at wavelengths of 405, 445, 532, 635, 780, 808, and 980 nm. The additional optical information can be used to estimate multiwavelength light absorption of the sampled particles, infer the concentration of Brown Carbon (BrC) in each sample, and further complement the use of carbon fractions in source apportionment studies (Chen et al., 2015; Chow et al., 2015).

DRI 2015 Series 2 software includes temperature programs for commonly-used protocols such as IMPROVE_A, EUSAAR_2, and NIOSH, and it can be programmed to emulate any other protocol. The simultaneous measurement of both R and T at all wavelengths throughout each analysis allows for reproducing any other thermal/optical method and holds potential for better characterizing additional properties of the carbonaceous aerosol.

THE MEASUREMENT PRINCIPLE

Thermal/optical carbon analysis is based on the preferential oxidation of OC and EC materials under different temperatures and atmospheres. A ~0.5 cm² punch from a particle-laden quartz fiber filter (or other sample form) is heated in programmed temperature steps. Organic compounds are liberated under a non-oxidizing helium atmosphere at lower temperatures up to 580°C, while EC is combusted in an oxidizing atmosphere with 2% O_2 at temperatures up to 840°C. The liberated carbon is oxidized to carbon dioxide (CO_2) by heated manganese dioxide (MnO_2), and the CO_2 is quantified by an NDIR detector. Seven modulated diode lasers measure the reflectance from, and transmittance through, each filter at wavelengths from 405 to 980 nm.



References:
Chen, L.-W.A.; Chow, J.C.; Wang, X.L.; Robles, J.A.; Sumlin, B.; Lowenthal, D.H.; Watson, J.G. (2014). Multi-wavelength optical measurement to enhance thermal/optical analysis for carbonaceous aerosol. Atmos. Meas. Tech. Discuss., 7:9173-9201. http://www.atmos-meas-techdiscuss.net/7/9173/2014/amtd-7-9173-2014-print.pdf

The most versatile laboratory OC/EC analyzer on the market.

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PRODUCT SPECIFICATIONS

DRI 2015 SERIES 2

MAIN TECHNICAL SPECIFICATIONS

Wavelengths: **405, 445, 532, 635, 780, 808, and 980 nm** (operation in both, transmission (TOT) and reflection (TOR) mode by default).

Measurement range: **0.1 to 1000 µg carbon/cm²** (depending on carbonaceous composition)

Minimum detection limits (MDL) in normal and with **high sensitivity (HS) module**:

- Total OC: 0.10 µg/cm2 (with HS: **0.03 µg/cm²**)
- Total EC: 0.08 µg/cm2 (with HS: **0.02 µg/cm²**)
- Total Carbon: 0.18 µg/cm2 (with HS: **0.06 µg/cm²**)

Support Gases:

- Ultra-high purity (UHP) helium (hydrocarbon free, >99.999% purity)
- 10% oxygen in UHP helium
- 5% methane in UHP helium
- Compressed air

Data reporting interval: **1 second**

Software: LABVIEW-Based

BrC Carbon 2015 CDI

ENVIRONMENTAL OPERATING CONDITIONS

- Temperature: 10 to 40°C
- Relative humidity: 30 to 80%, noncondensing
- IP protection: IP20

The unit is intended for indoor installations only.

OPERATING TEMPERATURES

Sample oven: programmable from 45 to 900°C with maximum heating rate 250 °C/minute

Oxidation oven: 900°C

Temperature accuracy: ±5°C or 1%, whichever is greater

PHYSICAL SPECIFICATIONS

- DRI 2015 Series 2 dimensions: 65 × 92 × 41 cm (26 x 36 ×16 inch)
- DRI 2015 Series 2 weight: 50 kg (110 lbs)

- DRI with autoloader: 65 × 92 × 56 cm (26 × 36 x 22 inch)
- DRI with autoloader: 59.1 kg (130.3 lbs)

- Electrical Power supply: 100-240VAC, 50/60Hz
- Power consumption: 2000 W maximum
- Allowable electrical supply voltage fluctuations: 90 – 264 V~
- Degree of protection against electric shock: Class I equipment
- Transient overvoltage protection: Overvoltage category II
- Pollution degree: 2

AUTOLOADER

- No of samples: 50
- Autoloader dimensions: 38 × 38 × 32 cm (15 × 15 x 13 inch)
- Autoloader weight: 9.1 kg (20.1 lbs)
- Sample cooling system: yes (lower than 20°C)
- Overpressured sample chamber: yes
- Fully automated operation: ≥24h

CE

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Keeping an Eye on the Air

DRI 2015 Series 2 is compliant with EN 16909:2017

Manufactured in EU by Aerosol d.o.o.

DRI 2015 Series 2 specification version 4.0 / 10 2023