

Real Time Ambient Air Monitor for Carbon Aerosols

EcoChem PAS 2000



Health Effects of Combustion Aerosols

Air pollution is increasingly recognized as an important factor for adverse health effects in urban communities. In particular, epidemiological studies have positively associated fine particle pollution with increased mortality from lung cancer and cardiovascular disease. Acute exposure has been linked to a range of adverse cardiovascular events including hospital admissions with angina, myocardial infarction, and heart failure. Long-term exposure increases an individual's lifetime risk of death from cancer and coronary heart disease. The main source of these adverse health effects seems to be combustion-derived carbon particles from transportation (diesel and gasoline vehicle emissions), manufacturing and power generation. Inhalation of this particulate matter leads to pulmonary inflammation with secondary systemic effects or, after translocation from the lung into the circulation, to direct toxic cardiovascular effects.

Why EcoChem is uniquely qualified to introduce this instrument?

Since 1991, EcoChem has pioneered the use of the Photoelectric Aerosol Sensor (PAS) for real-time measurement of carbon aerosols. These instruments are used by regulatory, research and industrial organizations. Incorporating customer feedback and state-of-the-art advances in measurement techniques, the PAS 2000 features the following technological advances:

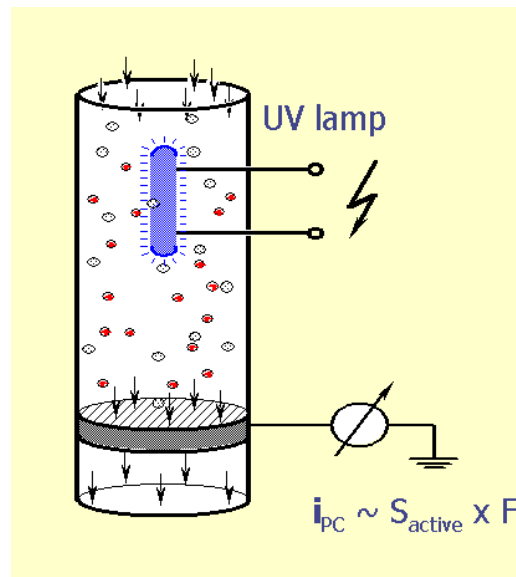
- Use of an UV Excimer lamp. This lamp has a higher efficiency than any traditional UV lamp. The Excimer Lamp can be rapidly switched on and off without a time delay. Operating the lamp in a chopped mode can eliminate the offset produced by pre-charged particles.
- The Excimer lamp produces monochromatic radiation with a half bandwidth of 2%
- Higher sensitivity instrument with a larger measurement range
- Total microprocessor control with internal data acquisition and storage
- Lighter and more compact design
- Responds to ultrafine respirable particles .
- Measures carbon aerosols which pose the significant health risk.
- Sensitive in the nanogm/m³ range.
- Simple, reliable, field-rugged and proven technology.
- Automated operation requiring minimum human intervention. Built-in data acquisition for data points.

Measuring Principle

The PAS 2000 works on the following principles:

- Using an Excimer lamp the aerosol flow is exposed to UV radiation. The Excimer lamp offers a high intensity, narrowband source of UV radiation. The wavelength of the light is chosen such that only the carbon aerosols are ionized, while gas molecules and non-carbon aerosols remain neutral.
- The carbon aerosol particles emit electrons, which are subsequently removed when an electric field is applied.
- The remaining positively charged particles are collected on a filter inside an electrometer, where the charge is measured. The resulting electric current establishes a signal, which is proportional to the concentration of Elemental Carbon and/ or PAH.

Also by operating the Excimer lamp in a chopped mode, the PAS 2000 can eliminate the background signal, which is associated with freshly generated aerosols. The chopped mode also enables a dynamic zero to be generated automatically by the instrument.



i_{PAS} = PAS Current
 S_{active} = Particle active surface area
 F = Surface chemistry factor

Calibration

Source-specific calibration curves are available or can be generated where the monitor output is compared to an analytically determined EC and PAH concentration. A site-specific calibration curve can provide greater accuracy for the particle size, charge and compound-specific to the source. In addition to the site-specific curves, an approximate universal calibration curve can be used for screening and real-time trending applications.

Technical Specifications

Display	LCD Panel with 128 by 64 pixel resolution
Power	115 volts AC / 60 Hz & 220 volts AC / 50 Hz
Range	User selectable: 0 to 100 picoamp or ~ 0 - 1000 ug /m3 EC, ~ 0 - 100 ug /m3 PAH
Sensitivity	~ 0.3 -1 ug /m3 PAH per picoamp (actual calibration is site-specific)
Lower Threshold	~ 1 femtoamp
Response time	< 10 seconds (adjustable)
Analog Output	(0 to 10 volt) and (0 to 20 mA or 4 to 20mA)
Digital Output	RS – 232
Sample gas	Built-in pump with flowrate controlled at 2 L/min
Operating temp	40 to 104 °F (5 to 40°C)
Dimensions	Standard Desktop Unit (Height x Width x Depth) --- analyzer unit 4.5in x 9.3in x 12.5in (133mm x 236mm x 317mm)
Weight	20 lb. (9 kg) -- analyzer unit
Data Storage	8000 Data Points (each data point consisting of: Date, Time, Value). Software User-friendly PC-compatible graphical software collects data from PAS 2000. The software displays real-time strip charts and calculates averages. Data is stored in a variety of formats. Flat ASCII file output can also be generated for further analysis in standard spreadsheet programs (e.g. Microsoft Excel).

Version 4.0 - Specifications subject to change without notice