

FEATURES SHEET

CHEMCOMB[®] MODEL 3500 SPECIATION SAMPLING CARTRIDGE

The ChemComb Speciation Sampling Cartridge is a flexible, field-proven sampling platform for the measurement of atmospheric gases and particles. It incorporates a honeycomb denuder design patented by Harvard University and other operational features that make it feasible for implementation in large-scale and/or long-term field measurements.

The sampling device is made up of a single cartridge that contains a well-characterized inlet with a PM-2.5 or PM-10 impactor, up to two honeycomb denuders for the removal or collection of selected gases, and a four-stage 47 mm diameter filter pack for the collection of particle-related components. PM-2.5 inlets are available for flow rates of 10 and 16.7 l/min, and a PM-10 inlet is available for 10 l/min. Systems with honeycomb denuders operate at 10 l/min to maximize the collection efficiency of the denuders. The unit can also be configured without honeycomb denuders to operate as a multistage filter pack for PM-2.5 or PM-10.

The ChemComb hardware has the following features:

- All sampling components are assembled in the laboratory and enclosed in the sampler's container. This eliminates the risks inherent in the infield assembly of sampling components. A small, rugged form factor permits easy transport or shipment of ChemComb cartridges in its assembled form between the laboratory and the air sampling site.
- ChemComb cartridges can be used in a large variety of sampling systems, ranging from Thermo's Partisol[®] Model 2300 Speciation Sampler, the Mini-Partisol[™] Air Sampler, and original Partisol Sampler, to simple configurations involving a flow-regulated pump.
- The sample inlet is designed to reduce the sample stream's residence time and contact with surfaces. A PTFE coating used in many applications minimizes losses of HNO₃ and NH₃. Clear anodized inlets are available for the collection of organic and elemental carbon on quartz fiber filters to avoid possible interferences from inlet surface coatings.
- The system achieves its sharp PM-2.5 or PM-10 size selection by means of impaction, resulting in a PM-2.5 cut point similar to that of the USEPA WINS impactor.



View looking through a honeycomb denuder.

ChemComb cartridge with 10 l/min PTFE-coated PM-2.5 inlet on the bottom, and modular sample flow exit at the top.

- The sample stream follows a straight flow path between the PM-2.5 impactor and the four-stage filter pack.
- Honeycomb denuders are small, rugged, and contain a large internal surface area. They are 47 mm in diameter, and only 38 mm long. Their internal surface area of 508 cm² is made possible by 212 hexagonal flow channels that are 2 mm on a side. This results in a much higher loading capability than conventional 20 cm long annular denuders, which typically have an internal surface area of approximately 310 cm². The entire ChemComb cartridge is less than 30 cm long.
- Honeycomb denuders are made completely of glass to avoid gas losses that can take place due to nitric acid and ammonia adsorption on the epoxy resin sometimes used in annular denuders. The use of the same material throughout the

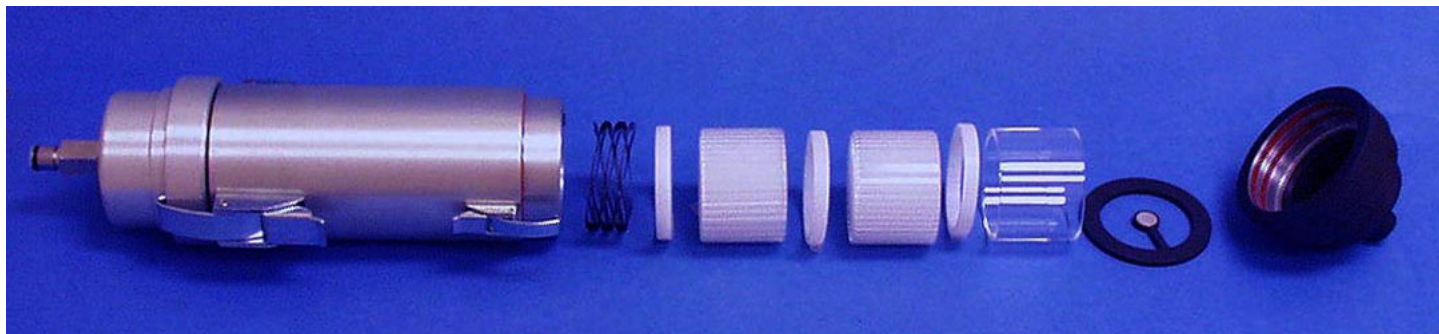
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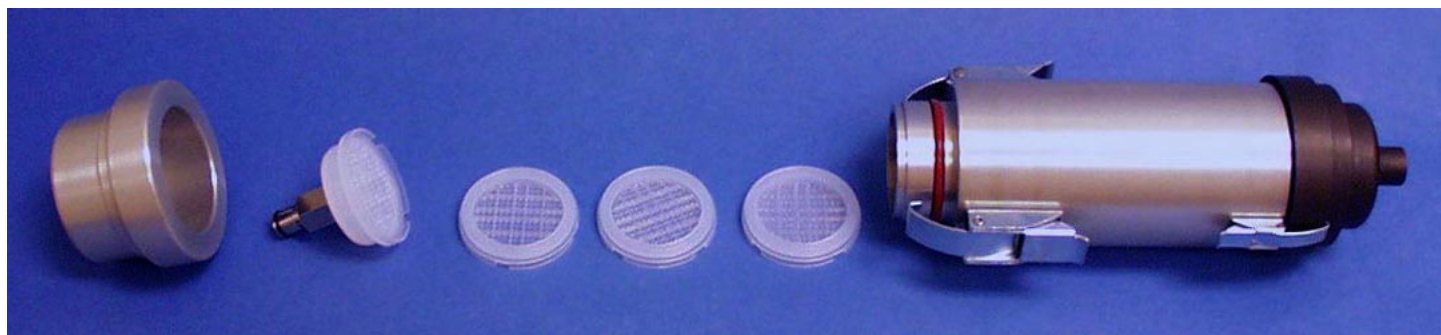
26 Tech Valley Drive (518)452-0065
East Greenbush, NY 12061 (518)452-0067 fax

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ChemComb cartridge with denuder section opened. Parts (from left to right) include the cartridge body, a metal spring (to keep components in place), HDPE spacer, honeycomb denuder, HDPE spacer, honeycomb denuder, HDPE spacer, glass spacer, keyhole impactor, PEFE-coated PM-2.5 inlet.



ChemComb cartridge with four-stage filter pack section opened. Parts (from left to right) include the filter pack cap, modular fitting and filter pack exit stage, 3 filter pack stages, and the cartridge body.

denuder avoids cracking that can otherwise occur due to large temperature changes.

- Honeycomb denuders are efficient collectors of inorganic gases such as HONO, HNO₃ and NH₃ through the application of different coatings in the laboratory. A denuder may be coated with a different substance each time it is used. Typically, a sodium carbonate/glycerol coating is used for the collection of acidic gases such as SO₂, HONO and HNO₃. A second denuder in series is often coated with a citric acid/glycerol solution for the collection of basic gases such as NH₃. Ion chromatography is often used as the analytical method.
- The four-stage 47 mm diameter filter pack is made of Teflon® material to avoid interferences. It is not necessary to populate each stage of the filter holder with a collection filter. A typical application of the ChemComb cartridge involves the following three 47 mm diameter filters: 1) a 2.0 µm pore-size Teflon filter for the collection of fine PM; 2) a glass fiber filter coated with sodium carbonate (Na₂CO₃) for the collection of nitric acid (HNO₃); and 3) a glass fiber filter coated with citric acid for the collection of ammonia (NH₃).

References:

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- Specifications subject to change without notice.
 - ChemComb is a registered trademark of Thermo Electron Corporation.