Restek Air

Versatile, High-Performing radiello Passive Air Samplers

- 3D radial design outperforms 2D axial samplers.
- Excellent low-level detection, even in short sampling times.
- High capacity ensures accurate long-term sampling.
- Easy to use—no pump required.

Now Available from Restek!

RESTEK Pure Chromatography www.restek.com

Versatile, High-Performing radiello Passive Air Samplers

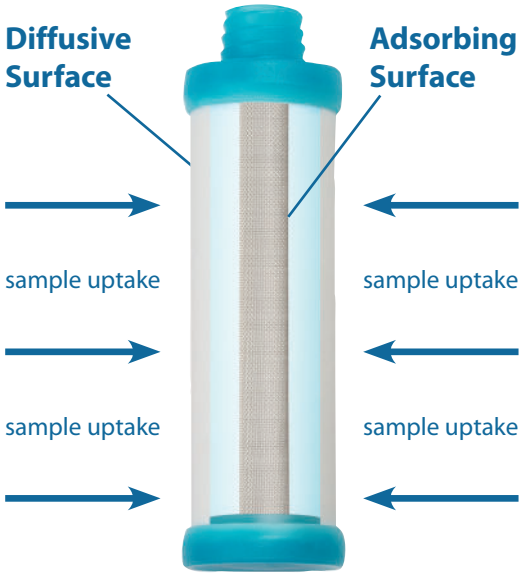
Now available from Restek, radiello passive diffusive air samplers feature a unique 3D radial design that provides several performance advancements compared to standard 2D flat axial air samplers. These samplers are a reliable, cost-effective alternative that offers both high sensitivity for low-level detection in short sampling periods, as well as higher capacity so accurate results can be obtained over longer sampling times. Versatile radiello air samplers are available for a wide range of chemical classes, so the choice of sampling material can be tailored to specific applications.

What Makes It Better?

The 3D cylindrical, coaxial design of radiello passive air samplers creates a large diffusive surface at a fixed, uniform distance from an adsorbent center column. Air enters from all sides and analytes are trapped on the large inner adsorptive surface. This results in a much higher sample uptake rate and capacity compared to standard 2D flat axial samplers.

The radiello Advantage

- Higher sample uptake rate provides ppbv sensitivity in short sampling periods.
- Higher capacity for more accurate long-term monitoring.
- Easy to use—no pump required.
- Not affected by face velocity.



Why Use radiello Air Samplers?

- Unique 3D radial design is not prone to face velocity effects and delivers higher uptake rates than standard 2D flat axial devices.
- Higher uptake rates give excellent low-level sensitivity, even for short sampling periods (down to 15 min).
- Higher capacity allows you to sample accurately up to 30 days without bias from breakthrough or back diffusion.
- Versatile, easy-to-use air sampler for a wide range of chemical classes is ideal for environmental monitoring, vapor intrusion, industrial hygiene, and personal air sampling.
- Solvent and thermal desorption options available.
- Features water repellant diffusive body and reusable holders.
- Easy to use—no pump required.

Unique 3D Radial Design Means radiello Air Samplers Have a Much Higher Sample Uptake Rate than 2D Axial Samplers.

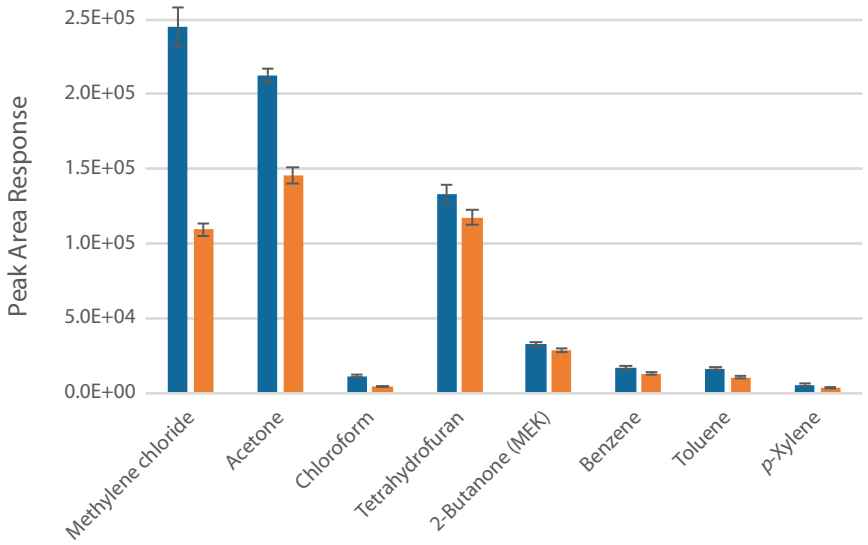
Compound	3D Radial radiello Sampler Uptake Rate (mL/min)	2D Axial Sampler Uptake Rate (mL/min)
Methanol	**125**	NS
Ethanol	**102**	44
Acetone	**77**	40
Benzene	**80**	36
Methyl ethyl ketone	**79**	36
Toluene	**74**	31
Ethylbenzene	**68**	27
n-Octane	**53**	27
Naphthalene	**25**	25

NS – Not suitable

Higher Sample Uptake Rates Mean High Sensitivity and Good Low-Level Detection, Even in Short Sampling Periods

The radiello Advantage

- Increased response for all compounds compared to axial samplers.
- Average increase in response of 163% for the 8 compounds shown below.
- Excellent reproducibility with an average RSD of 5.6%

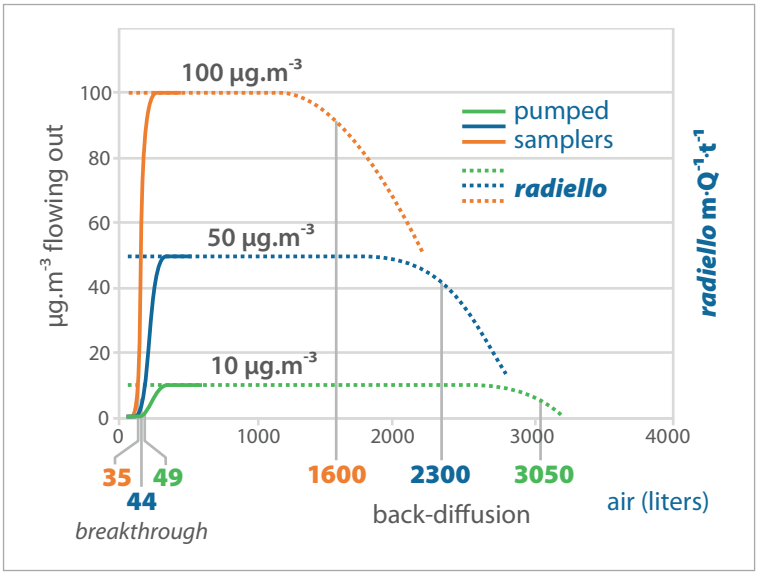


Three 8-hour samples were collected in a shipping facility with a radiello 130 air sampler and a traditional flat axial air sampler. Samples were extracted with 2 mL of carbon disulfide and analyzed by GC-FID. Error bars represent standard deviations.

radiello Samplers Have Higher Capacity than Axial Samplers, so You Can Report Accurate Results over Long Sampling Periods

In active sampling using a vacuum pump, the phenomenon of "breakthrough" occurs when the analyte band begins to move out of the adsorbent bed. If the concentration of analyte in the outlet air exceeds 10% of the concentration in the sampled air, any further pumping leads to analyte loss and an underrepresentation of the true environmental concentration. A similar situation, called "back diffusion," occurs with diffusion sampling. Although, radiello air samplers can exhibit back diffusion, the high capacity of these devices allows much higher sample volumes to be processed before this effect is observed.

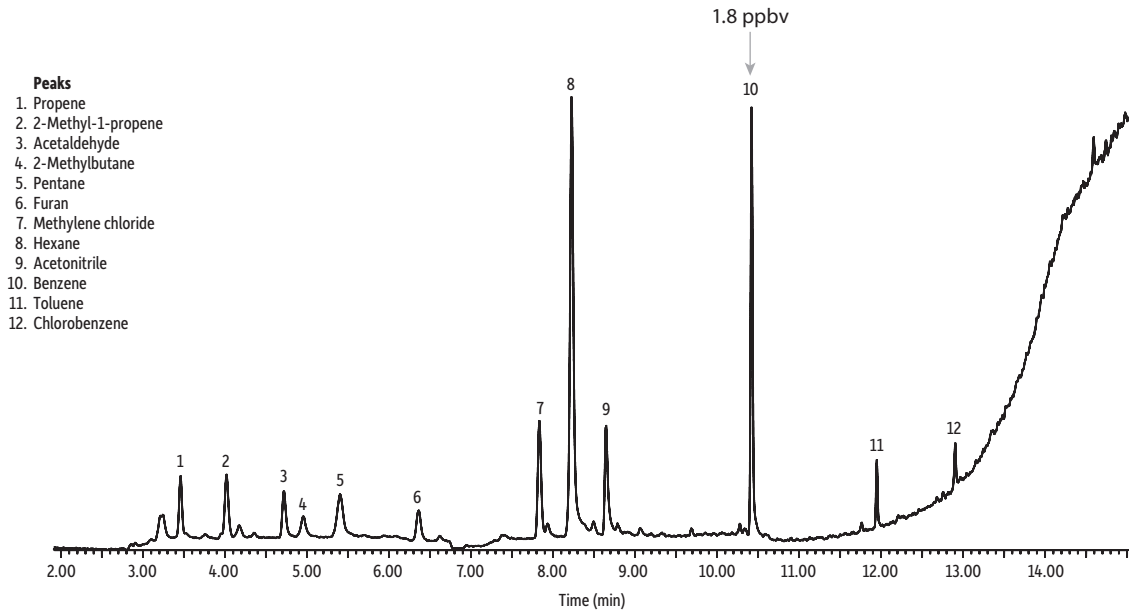
In this comparison, benzene is actively sampled (pumped) onto an activated charcoal adsorbent and also diffusively sampled using a radiello 130 sampler (both at 25 °C). For the pumped charcoal adsorbent (solid lines), breakthrough is reached at 35, 44, and 49 L when the benzene concentration is 100, 50, and 10 µg/m^3, respectively. Whereas, for the radiello sampler (dotted lines) back diffusion does not occur until 1600, 2300, and 3050 L at the same concentrations.



Example Applications: radiello 145

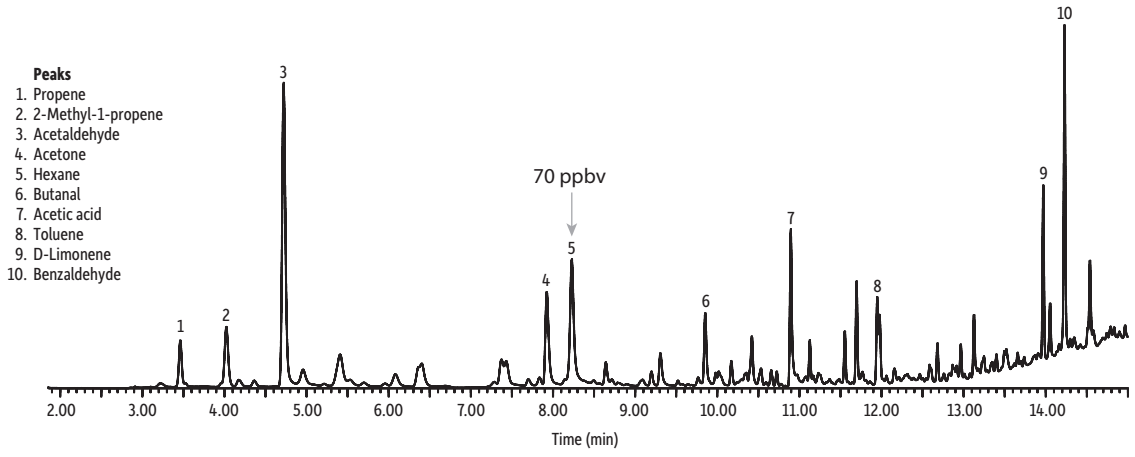
The radiello 145 (RAD145) air sampler is designed specifically for airborne volatile organic compounds (VOCs). The 3D radial, diffusive design provides much higher uptake rates and more capacity than standard 2D flat axial, diffusive samplers. The higher sample uptake rate means that ppbv levels of VOCs can be detected in very short sampling times.

4-Hr Shipping Facility Air Sample with radiello 145



GC_AR1171

16-Hr Laboratory Air Sample with radiello 145



GC_AR1170

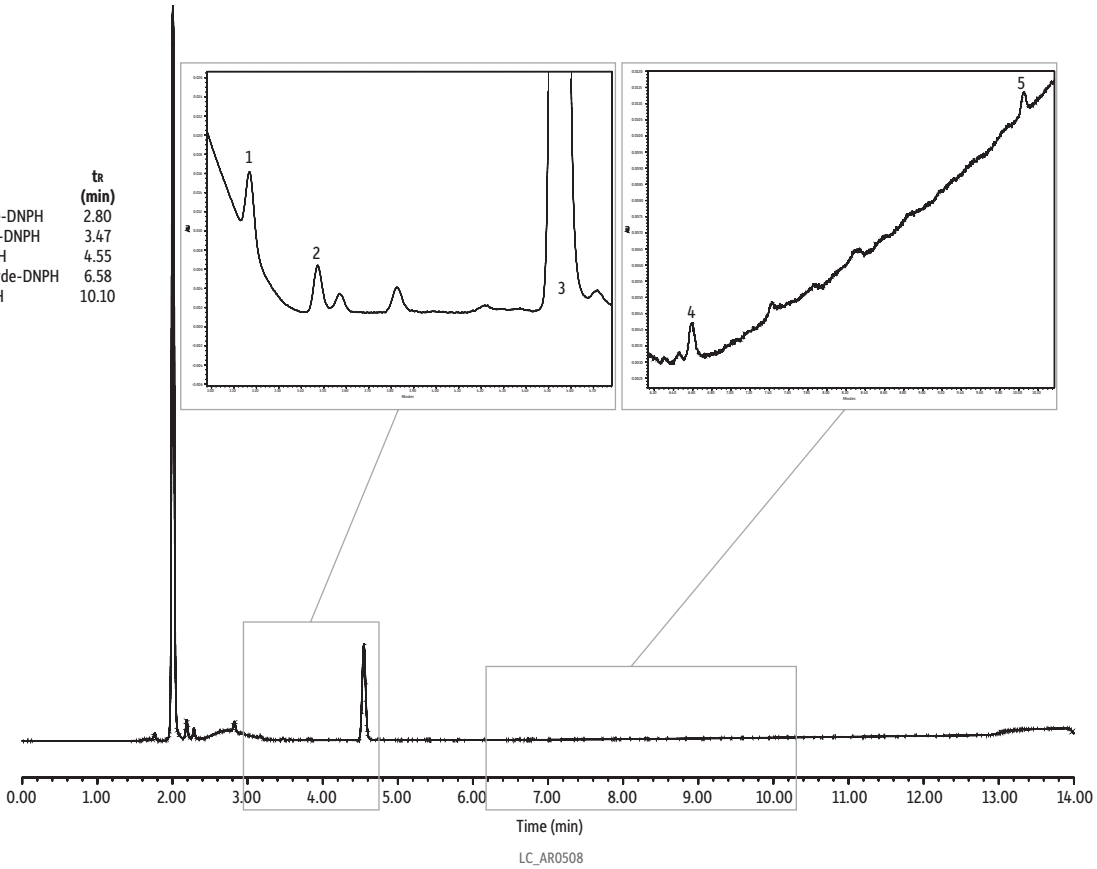
Column: Rtx-VMS, 60 m, 0.25 mm ID, 1.40 µm (cat.# 19916) with MXT low-dead-volume connector (cat.# 20536); **Injection:** on-column; **Oven:** Oven Temp.: 40 °C (hold 7 min) to 250 °C at 30 °C/min (hold 2 min); **Carrier Gas:** He, constant flow; Flow Rate: 2.0 mL/min; **Detector:** MS; Mode: Scan; Start Time: 8.80 min; Scan Range: 38 amu; Scan Rate: 226 scans/sec; Transfer Line Temp.: 250 °C; Analyzer Type: Quadrupole; Source Type: Extractor; Extractor Lens: 6 mm ID; Source Temp.: 230 °C; Quad Temp.: 150 °C; Electron Energy: 70 eV; Tune Type: BFB; Ionization Mode: EI; **Preconcentrator:** Markes Unity; **Trap 1 Settings:** Type/Sorbent : radiello 145; Desorb temp.: 350 °C; Desorb flow: 50 mL/min; Desorb time: 300 sec; **Trap 2 Settings:** Type/Sorbent: Air Toxics; Cooling temp.: 30 °C; Desorb temp.: 310 °C; Desorb time: 3 sec; **Instrument:** Agilent 7890B GC & 5977A MSD; **Notes:** The radiello 145 passive air sampler (RAD145) utilizes a stainless steel net cartridge packed with 350 mg of graphitized charcoal (Carbograph 4). Airborne volatile organic compounds (VOCs) were adsorbed to the charcoal and then thermally desorbed and analyzed by GC-MS. Trap 1 conditions were used for radiello desorption. Trap 2 conditions were used for Unity desorption.

Example Applications: radiello 165

Monitoring airborne carbonyls (aldehydes and ketones) is important for protecting human and environmental health. A radiello 165 (RAD165) passive sampler is ideal for collecting these compounds from either indoor or outdoor air. The 3D radial design ensures high sample uptake rates, allowing ppbv level detection. The large capacity allows for longer sampling periods to be used when desired.

16-Hr Laboratory Air Sample with radiello 165

Peaks	t_R (min)
1. Formaldehyde-DNPH	2.80
2. Acetaldehyde-DNPH	3.47
3. Acetone-DNPH	4.55
4. *n*-Butyraldehyde-DNPH	6.58
5. Hexanal-DNPH	10.10



Column: Raptor C18 (cat.# 9304A65); Dimensions: 150 mm x 4.6 mm ID; Particle Size: 2.7 µm; Pore Size: 90 Å; Temp.: 30 °C; Diluent: 2 mL acetonitrile extract; Inj. Vol.: 5 µL; **Mobile Phase:** ; A: Water; B: Methanol:acetonitrile (650:50)*; **Gradient (%B):** 0.00 min (70%), 5.00 min (75%); 11.00 min (90%); 11.01 min (100%); 12.00 min (100%); 12.01 min (70%); 14.00 min (70%); **Flow:** 0.8 mL/min; **Detector:** UV/Vis @ 365, 4.8 nm; **Preconcentrator:** radiello 165; **Instrument:** Waters ACQUITY UPLC H-Class; **Notes:** The radiello 165 passive air sampler (RAD165) utilizes a stainless steel net cartridge filled with 2,4-dinitrophenylhydrazine (DNPH) coated Florisil adsorbent. Airborne carbonyls react with the DNPH to form stable hydrazones. The derivatives were subsequently extracted for 30 minutes with 2 mL of acetonitrile. The extract was then analyzed by LC-UV. *Mobile phase B was prepared by combining 650 mL methanol and 50 mL acetonitrile.

radiello air samplers are available for a wide range of chemical classes. See our selection for the best choice for your application!

www.restek.com/radiello

radiello Passive Diffusive Air Samplers—Now Available from Restek

Description	qty.	cat.#
Samplers and Diffusive Bodies		
White diffusive body for general use	20-pk.	RAD120
Blue diffusive body (same as white, but opaque to light)	20-pk.	RAD1201
Yellow diffusive body (for thermal desorption cartridge RAD145)	20-pk.	RAD1202
Permeative body for anesthetic gases/vapors	20-pk.	RAD1203
Sterile sampler for anesthetic gases and vapors	10-pk.	RAD125
radiello cart. VOCs CS2 desorption SS net (100 mesh, 5.9 mm dia), activated charcoal (35-50 mesh)	20-pk.	RAD130
Starter kit: 1 complete sampler for BTEX/VOCs, CS2 desorption, white diffusive body, cartridge + blank, support plate, adaptor	kit	RAD130S
radiello cart. Anesthetic gases/vapors SS net w/mix of mol sieve & activated charcoal (35-50 mesh)	20-pk.	RAD132
radiello cart. Thermal desorption SS net (3 x 8 µm mesh, 4.8 mm dia), 350 mg Carbopack X (40-60 mesh)	20-pk.	RAD141
Starter kit: 1 complete sampler for 1,3-butadiene & isoprene, thermal desorption, yellow diffusive body, cartridge + blank, support plate, adaptor	kit	RAD141S
radiello cart. VOCs thermal desorption SS net (3 x 8 µm mesh, 4.8 mm dia), 350 mg Carbograph 4 (40-60 mesh)	20-pk.	RAD145
Starter kit: 1 complete sampler for BTEX/VOCs, thermal desorption, yellow diffusive body, cartridge + blank, support plate, adaptor	kit	RAD145S
radiello cart. Phenol, methylphenol and dimethylphenol TD - SS net (100 mesh, 4.8 mm dia), 250 mg Tenax-TA	20-pk.	RAD147
radiello cart. Aldehydes SS net w/ 2,4-DNPH coated Florisil	20-pk.	RAD165
radiello cart. HF, NO2, & SO2- microporous PE coated w/ wet TEA	20-pk.	RAD166
radiello cart. NH3 microporous PE impregnated w/ phosphoric acid	20-pk.	RAD168
radiello cart. HCl SS net w/ silica gel (0.1-0.4 mm particle size)	20-pk.	RAD169
radiello cart. H2S microporous PE impregnated with zinc acetate	20-pk.	RAD170
Starter kit: 1 complete sampler for H2S, white diffusive body, cartridge + blank, support plate, adaptor	kit	RAD170S
radiello cart. Ozone microporous PE tube with silica gel coated with 4,4' dipyridylethylene	20-pk.	RAD172
Sampler Accessories		
Triangular support plates	20-pk.	RAD121
Vertical adaptors for personal sampling	20-pk.	RAD122
Vertical snap ring adaptors for ready-to-use sampler	20-pk.	RAD1221
Polycarbonate caps for ready-to-use sampler	20-pk.	RAD1241
Polypropylene containers for ready-to-use sampler	20-pk.	RAD1242
Empty glass tubes with stopper, 2.8 mL	100-pk.	RAD1991
Empty plastic tubes with stopper, 12 mL	100-pk.	RAD1992
Electronic Devices		
Thermometer Kit (3x RAD122 with Thermometer)	3-pk.	RAD126
Thermometer Kit (3x RAD1221 with Thermometer)	3-pk.	RAD1261
Thermometer reader	ea.	RAD127
Sampler Housing		
Clips to suspend triangular plates	20-pk.	RAD195
Outdoor sampling shelter	10-pk.	RAD196
Strips to suspend outdoor shelter	100-pk.	RAD198


RAD1221


RAD1201


RAD132


RAD1203


RAD168


RAD1242


RAD1992


RAD130


RAD141

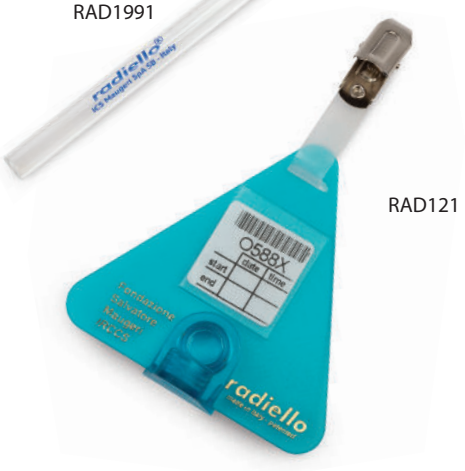

RAD1991


RAD170

RAD1241

RAD120

RAD1202


RAD121


RAD195


RAD122

Get What You Need, When You Need It

We stock an extensive line of air sampling supplies, so you can count on getting exactly what you need quickly—without shipping delays or long lead times. Keep your lab up and running with Restek!

RESTEK
Pure Chromatography

Questions? Contact us or your local Restek representative (www.restek.com/contact-us).

www.restek.com

QUALITY ISO 9001 · 17025 · 17034

Lit. Cat.# GNSS2960-UNV