MARKES international

Version 1.0
September 2021

Radiello

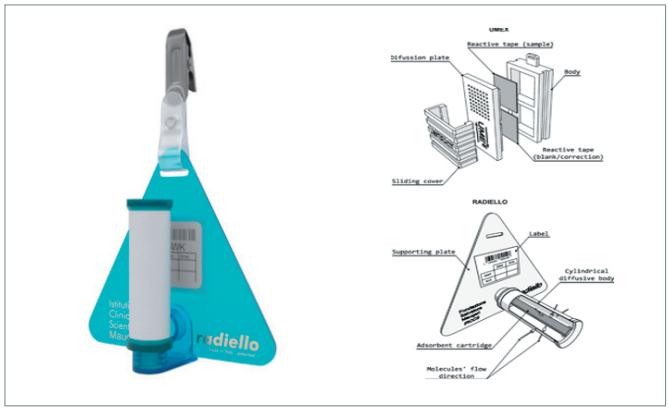
Radial Symmetry Diffusive Sampler

The perfect choice for Environmental and Industrial Hygiene applications

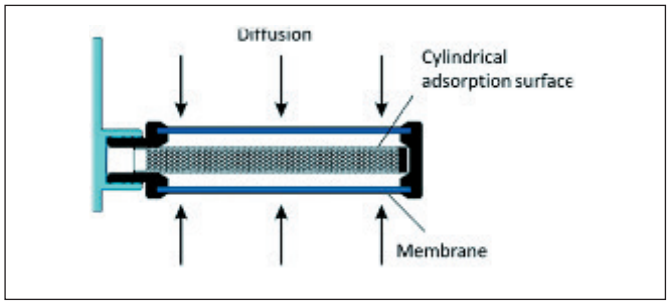
Istituti Clinici Scientifici Maugeri

Radiello is the new concept of air sampling, dedicated to air quality monitoring with a simply procedure and a dedicated diffusive technology named “Radial”. Apart from the adsorbing cartridge, if not differently stated, all of the other components can be repeatedly used for several sampling experiments Practical, innovative, available for a number of compounds, such as:

VOC with chemical and thermal desorption
Aldehydes with use of DNPH-tagged enriched supports
Inorganic acids
Phenols
NO and S02
Anesthetic gases such as nitrous oxide and halogenated compounds
Ozone
Ammonia
Hydrogen Sulphide



The essential parts of radiello® are: adsorbent cartridge, diffuse body, supporting plate and adhesive barcode label. All radiello® components, except for adsorbent cartridges, can be used for a very large number of samplings, unless otherwise specified. In axial diffusive sampling, the diffusive and adsorbent surfaces consist in two plane and opposing sides of a closed, usually cylindrical, box. In the concentration gradient process, the adsorbable molecules (colored in the figure) penetrate the diffusive surface and are trapped by the adsorbent surface.

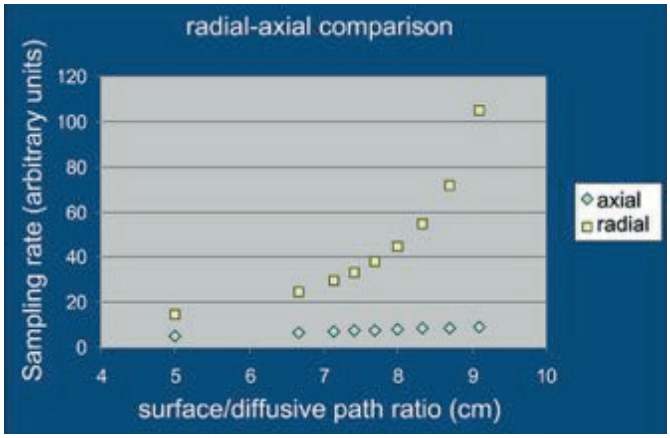


Passive sampling does not involve the use of heavy and encumbering pumping systems, nor has energy power supply problems, requires no supervision, is noiseless, non-flammable and does not represent an explosion hazard, can be used by everybody everywhere, has extremely low investment costs.

Moreover, it is not susceptible to sample breakthrough, unlike what happens with samplings performed with air pumps. Why, then, diffusive sampling has not been so extensively adopted up to now as it should do? This is due to the fact that the traditional axial symmetry sampler has generally poor sensitivity and reproducibility because of the limits set by its geometry. On one side, uptake rate values are generally low, on the other side, they often vary depending on environmental conditions. These limitations have been overcome by radiello®.

Thanks to radial symmetry, the uptake rate is:

- high, since it does not vary linearly but exponentially with the diffusive surface/ diffusive path length ratio (see equation [5]). With the same dimensions, its uptake rate is at least three times higher than that of any axial diffusive sampler;
- constant, due to the high adsorbent capacity of the inner cartridge;
- reproducible, thanks to the stiffness of the diffusive surface and of the cartridge and to the close tolerances featuring all the components of radiello®;
- invariable with air speed, in virtue of the tortuosity of the diffusive path inside the microporous diffusive cylindrical surface;
- precisely known, because it is not calculated but experimentally measured in a controlled atmosphere chamber in a wide range of concentration, temperature, relative humidity, air speed conditions and with or without interferences.



TECHNICAL NOTICE:
While the uptake rate of axial samplers increases linearly with the diffusive surface/ diffusive path length ratio, the radial sample uptake rate increases exponentially. If for instance an axial sampler with di ffusive surface/ diffusive path length ratio of 8:1 has an uptake rate of 8 (regardless of dimensions), the sampling rate of a radial sampler (with equal ratio value) is 45.

Also radiello®

- is relatively insensitive to atmospheric conditions due to the water-repellent diffusive body
- has blank values lower than three times the instrumental noise due to thecomplex conditioning procedures of the bulk adsorbing materials and to repeated quality controls along the whole production
- detection limits are so low and adsorbing capacities so high that allow depending on the types exposure time duration from 15 minutes to 30 days and concentration measurements from 1 ppb to over 1000 ppm
- offers high precision and accuracy over a wide range of exposure values
- allows thermal desorption and GC-MS analysis without interfering
- allows the sampling of a vast range of gaseous pollutants
- is resistant and chemically inert, being made of polycarbonate, microporous polyethylene and stainless steel
- offers unlimited reusability of all its components except for the adsorbing cartridge, though it can be recovered if thermal desorption is employed
- is the result of one of the main European scientific research institutions that produces it directly with very advanced technologies, continuously submitting it to severe tests, performing research and development in its laboratory in Padova.

The components of radiello®

The essential parts of radiello are the adsorbing cartridge, the diffusive body, the supporting plate and the adhesive label with the bar code indication. Apart from the adsorbing cartridge, if not differently stated, all of the other components can be used for a lot of sampling experiments.

The adsorbing cartridge

Depending on the polluting compound to be sampled, several different kinds of adsorbing or chemi adsorbing cartridges have been developed. Their dimensions are neverthless the same for all: 60 mm length and 4,8 or 5,8 mm diameter. They are contained in glass or plastic tubes wrapped up in a transparent polyethylene thermo welded bag. The part number, printed onto the bag along with the lot number and expiry date indicates the kind of cartridge. On the other side from the thermal desorption cartridges, all of the other kinds are for single use only. Available in 5 or 20 pieces per package only.

The diffusive body

Four kinds of diffusive bodies are available, with like outer dimensions: 60 mm height and 16 mm diameter.

- The white diffusive body, code C-RAD120, of general use, is made of microporous polyethylene 1.7 mm thick and average porosity 25 ± 5 µm. Diffusive path length is 18 mm.
- The blue diffusive body, code C-RAD120-1, has the same properties of the white one but is opaque to light: it is suited to the sampling of light-sensitive compounds.
- The yellow diffusive body, code C-RAD120-2, should be used whenever the sampling rate must be reduced; it is made of microporous polyethylene 5 mm thick and average porosity 10 ± 2 µm. Diffusive path length is 150 mm.
- The permeative diffusive body, code C-RAD120-3, is a 50 µm thick silicone membrane strengthned by a stainless steel net. It is employed for anaesthetic gases and vapours sampling. Available in 20 pieces per package only. The diffusive body has to be screwed onto the supporting plate.

The supporting plate

It is identified by the code C-RAD121. Made of polycarbonate, it acts both as closure and support for the diffusive body, which has to be screwed onto the thread. It comes along with a clip and a transparent adhesive pocket to hold the label. The three parts are to be assembled before use. Available in 20 pieces per package only.

The labels

Self-adhesive, with printed barcode number. Since each barcode number has been printed in only one copy, it allows an unmistakable identification of the sampling tube on field and in the laboratory for the subsequent analysis. Each package of 20 adsorbing cartridges contains also 21 labels. If ordered separately, they are shipped in 198 pieces per package only.

Weather protection kit for outdoor exposition

The kit includes one mounting set for propylene protection device that can accommodate several passive samplers for outdoor use. The easy-to-mount device allows reliable sampling data by protecting radiello® passive samplers against bad weather conditions.

How to use Radiello passive sampler

Before using radiello, you will need to mount the clip onto the supporting plate for hanging, along with the transparent adhesive label pocket.

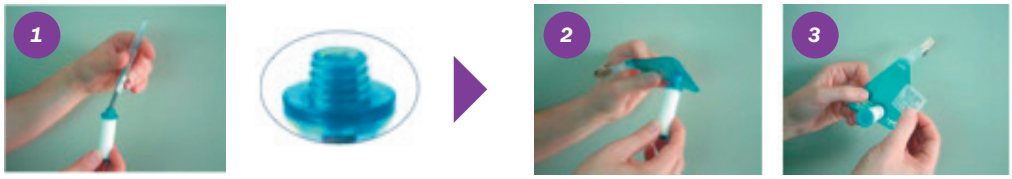
(1) Insert the clip clamp into the plate slot with the pin facing upwards.

(2) Bend the clamp and snap the pin into its hole.

(3) Pull off the transparent pocket from its paper base...and stick it in the center of the plate

(4) If you prefer, the pocket can be applied to the rear of the plate, but MAKE SURE that the label insertion slot is always on one side (otherwise, if it starts raining the label can get wet).

Starting sampling in the field



(1) The diffusive body has a recess at the bottom for the centering of the cartridge. A correctly centered cartridge should not stick out even by half a millimeter. If it does, the cartridge is not correctly positioned and out of axis. A misaligned cartridge could deform when the diffusive body is screwed onto the plate, the geometry of your radiello® could be altered and the sampling result unreliable. Simply shake the diffusive body, to fit the cartridge into place.

(2) Keeping the diffusive body vertical, screw it onto the supporting plate without forcing.

ATTENTION. Do not keep the diffusive body horizontal while screwing it onto the plate: the cartridge could come out from its housing and stick out.

(3) Insert a label in the pocket without peeling it off from adhesive paper. Keep note of date and time and expose radiello. Sampling has started.

After sampling

Keep note of the date and time of the end of exposure. Place the cartridge into the tube, peel off the label and stick it onto the tube so that the barcode is parallel to the axis of the tube. If you have sampled different polluting compounds at the same time, BE

CAREFUL NOT TO MIX UP THE TUBES: place the cartridge in its original tube, identified by the code printed on the plastic bag.

IMPORTANT!! Always stick the label with the barcode parallel to the axis of the tube: any other position will compromise the barcode automated reading by the optic reading device.

Tech Tips

- Avoid touching the cartridge with your fingers, particularly if it is impregnated with reactive.
- Even if you can write the start/stop date and time on the label, we suggest keeping note of these data separately: your writing might become illegible after one week exposure to bad weather.
- DO NOT USE MARKER PENS to write on the label: they contain solvents that are sampled by radiello!

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Ordering information

Part Number	Product
C-RAD120	White diffusive body
C-RAD1201	Blue diffusive body
C-RAD1202	Yellow diffusive body
C-RAD1203	Diffusive body for anesthetics
C-RAD121	Cartridge supporting plate
C-RAD122	Adapter for cartridge vertical mount
C-RAD1221	Vertical adapter for ready-to-use sampler
C-RAD125	Sterile samplers for anesthetic gases
C-RAD126	Data logger thermometer
C-RAD1261	Data logger thermometer for ready-to-use sampler
C-RAD130	Activated carbon cartridges for CS2 desorption (20 pcs)
C-RAD132	Cartridges for non-sterile anesthetic gases (20 pcs)
C-RAD141	CarboPack-X Kit -thermal desorption (1.3 Butadiene) (20 pcs)
C-RAD141S	CarboPack-X - thermal desorption
C-RAD145	Carbon cartridges for thermal desorption (20 pcs)
C-RAD145S	Starter kit for desorption cartridges
C-RAD147	Tenax cartridges for phenols and odorous substances (20 pcs)
C-RAD165	DPNH cartridges for aldehydes (20 pcs)
C-RAD166	TEA cartridges for N02/S02/HF (20 pcs)
C-RAD168	H3P04 cartridges for ammonia NH3 (20 pcs)
C-RAD169	Silicagel cartridges for HCl (20 pcs)
C-RAD170	Cartridges for H2S (20 pcs)
C-RAD171	Calibration solution for H2S
C-RAD172	Ozone cartridges (20 pcs)
C-RAD190	Labels
C-RAD195	Clips
C-RAD196	Weather-proof box
C-RAD198	Mounting strips
C-RAD301	Glutaraldehyde standard solution
C-RAD302	Aldehydes standard solution
C-RAD405	BTEX Calibration Kit (CS2 Desorption)
C-RAD406	VOC Calibration Kit (chemical desorption)
C-RAD407	BTEX Calibration Kit (chemical desorption)

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