

Air monitoring around the world.

Regulatory considerations and testing solutions for
particulate matter in ambient air.



One planet. One atmosphere. One partner. One supplier.

In 1953, Jack Bush established the Millipore Filter Company, named after a sponge that lives in the Adriatic Sea. Millipore filters were among the first to be used for ambient air monitoring, as early as the 1970s.

Particulates and contaminants in the air affect human capital, the most precious natural resource our planet supports. Recognizing the need to protect this resource, industries, governments and associated regulatory agencies around the world monitor ambient air. Millipore filters, now supplied by Merck Millipore, are used in these ambient air monitoring methods.

Recently, the focus has been on PM_{2.5} levels, which have been linked to respiratory problems, cancer, and aging-related disorders such as Alzheimer's disease and bone damage. Major regulatory agencies have now issued guidances and methods for monitoring PM_{2.5}, as outlined in Table 1.

Use this brochure to select the appropriate filters for air monitoring that match the specifications with respect to regional regulatory considerations.

| Regulated Methods | Annual Limit | Filter Diameter | Filter Material | EMD Millipore Catalogue No. |
|---|-----------------------|---|---|-------------------------------|
| US, Japan US EPA 40 CFR part 50 | ≤35 µg/m ³ | 46.2 mm ±0.25 mm | • PTFE with a ring (For reference / manual method) | PM2547050 |
| | | | • Glass fiber roll for automated / equivalent methods | Call for ordering information |
| EU EN12341 – 2014 | ≤25 µg/m ³ | 50 mm | • PTFE with a ring (For reference / manual method) | PM2547050 |
| | | | • Glass fiber | AP2004700 |
| | | | • Quartz fiber | AQFA04700 |
| China HJ 656-2013 | ≤35 µg/m ³ | Low Flow: 47 ±0.25 mm Moderate Flow: 90 ±0.25 mm High Flow: 200 x 250 mm | • PTFE with a ring (For reference / manual method) | PM2547050 |
| | | | • Glass fiber | AP2004700 |
| | | | • Quartz fiber | AQFA04700 |

Table 1. PM_{2.5} Regulatory Guidance by Geography

Technology Highlight

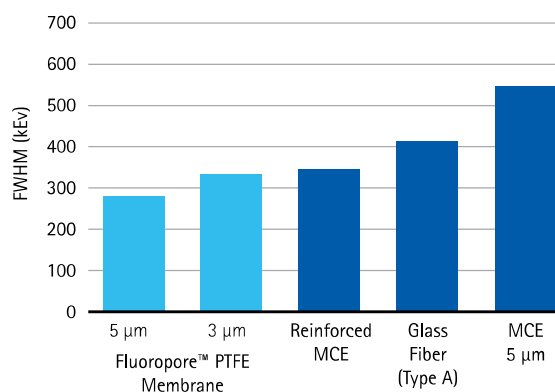
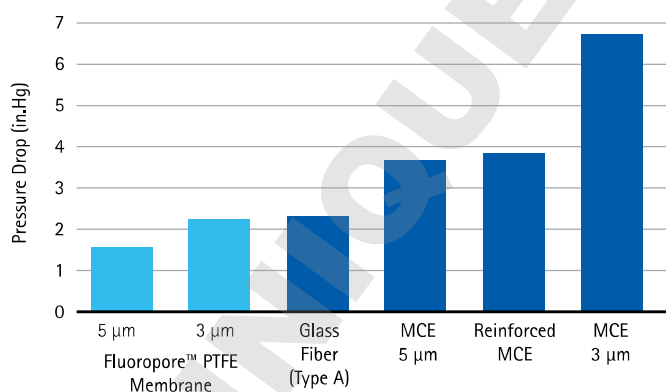
Radioactive alpha particle monitoring

In order to reap the benefits of nuclear energy responsibly while maintaining clean air, users and regulatory organizations must monitor the degree to which radioactive byproducts of human activity enter the environment.

To support efficient, convenient radiation monitoring, Merck Millipore has developed a special Fluoropore™ membrane filter designed for alpha particle collection in single-use and continuous air monitors. Fluoropore™ membrane is approved for use by the French Institute for Radiological Protection and Nuclear Safety in Saclay, France as well as national labs in North America and Asia.

The Fluoropore™ filter for alpha particle monitoring provides:

- **Improved detection accuracy.** Unlike fibrous filter media that trap particles in their matrix, Fluoropore™ membranes collect particles on their surface. This surface collection keeps particles closer to the detector, providing better detection efficiencies and improved resolution.
- **Choice of pore sizes.** Fluoropore™ membranes are available in 3 and 5 μm pore sizes. The smaller pore size provides high resolution. The larger pore size has very low pressure drop and greater throughput capacity, which minimizes the number of filter change-outs.
- **Contrasting backing material.** The 5 μm Fluoropore™ membrane is bonded to a gridded backing made from high density polyethylene fiber. The contrast between the top and bottom of the filter prevents incorrect installation in sampling devices. The backing also reduces the electrostatic charge of the filters and makes them easier to handle.



Lower pressure drop, lower FWHM* measurements. Merck Millipore's Fluoropore™ PTFE membranes exhibit lower pressure drop (A) and collect particles on the surface, providing better detection efficiencies and lower FWHM measurements (B). Room air was collected at 1.7 m³/h (1 standard cubic foot/min).

*FWHM, a measure of spectral quality/resolution, is defined as the full width at half of the maximum height of the Po-218 peak obtained during air sampling of room air.

For ordering information, see page 8.

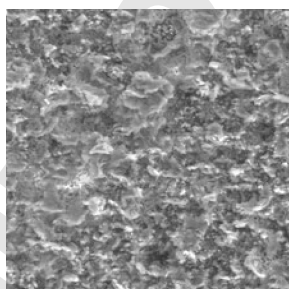
Choose a filter depending on your application.



Certified PTFE filters validated to match USEPA method requirements

Ideal for monitoring fine PM_{2.5} particulates and sensitive analyses, PTFE filters are very chemically resistant. Merck Millipore's certified PTFE discs for PM_{2.5} sampling also feature a chemically resistant, ultrasonically sealed polypropylene support ring, which provides:

- Faster equilibration during weighing steps
- Resistance to membrane curling
- Unique serial number printed on the ring for accurate tracking



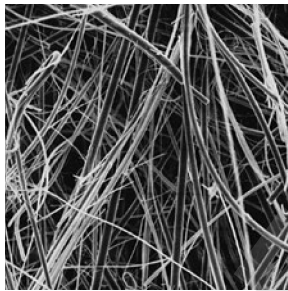
Mitex™ Pure PTFE Filters

Mitex™ membrane is unbacked, yet is easy to handle, combining the convenience of a backed membrane with the versatility of a pure PTFE membrane. Mitex™ membrane is hydrophobic. These filters are commonly used in tests for SO₂, CO, NO₂, NO, O₃ and other noxious gases.

FEATURES & BENEFITS

- Broad chemical compatibility
- Biologically and chemically inert
- Stable at temperatures in excess of 260 °C (500 °F) and below -100 °C (-148 °F)

For ordering information, see page 8.



Quartz Fiber Filters (Type AQFA)

Made of quartz fibers with no glass fibers or binders. Merck Millipore's pure quartz manufacturing process involves a heat treatment step to improve cleanliness, preventing the filters from reacting with acidic gases, unlike glass fiber filters that can react and cause false readings. This makes Merck Milipore's quartz filters well-suited for measuring heavy metal concentrations and small amounts of particles (such as PM2.5 ambient air monitoring methods). The filters also exhibit good weight and form stability; in fact, the 3.0 micron filter features 99.998% retention. Quartz fiber disc filters are available in a wide range of flow rates and throughput capacities.

Glass Fiber Filters with Binder Resin (Type AP20)

With binder resin, glass fiber filters exhibit less weight loss and minimal particle shedding. They also exhibit lower fine particle retention and higher dirt-holding capacity than PTFE filters. Our glass fiber filters with binder resin are available with two different thickness options:

- Type AP20: Thickness = 380 μm
- Type AP2T (Thin)*: Thickness = 250 μm –360 μm

*Contact customer service for ordering information

For ordering information, see page 8.

Developed using USEPA standards to protect our environment.

Merck Millipore ensures that membrane discs match regulatory specifications.

Certification documents for each product will be shipped in each box. Detailed test results can be obtained by contacting Merck Millipore Technical Support.

| Test | Specification* | AP20 Glass Fiber | AQFA Quartz Fiber | PTFE Filter with Ring |
|---|-----------------------------------|------------------|-------------------|-----------------------|
| Temperature Stability | ≤ 20 µg / filter disc | 4 | 16 | -4.0 |
| Loose Particle Test | ≤ 20 µg / filter disc | 22 | 39 | 1.0 |
| Particle Retention | ≥ 99.7% | > 99.9% | > 99.9% | > 99.9% |
| Pressure Drop | ≤ 3 kPa at 0.45 m/s air flow rate | ~ 1 kPa | ~ 1 kPa | 0.65 kPa |
| Additional tests performed for certified PTFE filters as per U.S. EPA guidelines** | | | | |
| Alkalinity | ≤ 25 µeq / g filter | | | 0.3 |
| XRF Analysis | Low background signal | | | Meets |

* As Per Chinese PM2.5 Sampling Standard. ** Certification documents for each product, stating that all tests were carried out according to United States Environmental Protection Agency (EPA) requirements, will be shipped in each box.

Angled, earth-friendly packaging for certified PTFE discs.

Unlike PTFE filter discs from other suppliers, Merck Millipore's certified PTFE filter discs are sold in low-static packaging, in which filters are placed at an angle. This packaging makes it easier to remove discs with forceps and makes it less likely that the product will be damaged.

Earth-friendly Packaging.

Packaging for certified PTFE membranes for PM2.5 testing is 100% recyclable and is accompanied by a certificate of analysis.

For ordering information, see page 8.

Accessories

Handle Membranes with Merck Millipore's Popular Filter Forceps.

Flat-tipped forceps combined with angled packaging make it easy to handle certified PTFE filters for PM2.5 sampling.



| Description | Catalog No. |
|-------------------------|-------------|
| Filter forceps (3/pack) | XX6200006P |

Store Membrane Filters for Future Microscopic Analysis in PetriSlides™ Membrane Display Box

Holds filter securely in place. Transparent cover allows microscopic examination without removal. Rectangular base has rounded corners for mounting on microscope stage.



| Description | Catalog No. |
|-----------------------------------|-------------|
| PetriSlides™ Membrane Display Box | PD1504700 |

Environmental Monitoring: Sample Collection, Preparation, Analysis

Whether you need to collect large quantities of air or analyze soil or water for hazardous chemicals, we can supply the expertise, products and protocols to ensure superior analytical results and compliance with regulatory requirements. Merck Millipore devices and systems designed for environmental applications have been developed for use with standard methods.

Use our online membrane selection wizard to search for filters by regulated method.



Air Monitoring

- Ambient air monitoring
- Alpha particle monitoring
- Industrial particulates



Soil Monitoring

- Toxicity Characteristic Leaching Procedure (TCLP)
- Extraction
- Gas chromatography
- Ion chromatography



Water Testing

- Ground water
- Waste water
- Drinking water
- Storm drain water

Explore Merck Millipore's products for environmental particle monitoring: www.merckmillipore.com/pollutiontesting

Ordering Information for Ambient Air Monitoring Solutions

| Filter | Diameter | Pore Size (µm) | Qty/Pk | Catalog No. |
|--|---------------------|----------------|--------|------------------------|
| 2 µm PTFE Membrane Discs for PM2.5 Monitoring (PTFE with ring) | 46.2 mm ±0.25 mm | 2.0 | 50 | PM2547050 |
| Mitex™ PTFE Membrane Filters for SO ₂ /NO Testing | 47 mm | 5.0 | 100 | LSWP04700 |
| Glass Fiber Disc Filters (Type AP20) | 47 mm | 2.0 | 100 | AP2004700 |
| Glass Fiber Filter Roll (Continuous PM2.5 Monitoring) | Roll | 2.0 | 1 Roll | available upon request |
| Quartz Fiber Disc Filters (Type AQFA) | 47 mm | N/A | 100 | AQFA04700 |
| Quartz Fiber Filter Sheet (8"x10" sheet) | 8 x 10 in. | N/A | 50 | AQFA8X105 |
| Fluoropore™ Disc Filters for Radiation Monitoring | 25 mm | 3.0 | 100 | FSLW02500 |
| | 47 mm | 3.0 | 100 | FSLW04700 |
| | 90 mm | 3.0 | 25 | FSLW09025 |
| | 47 mm | 5.0 | 100 | FMLW04700 |

To Place an Order or Receive Technical Assistance

In Europe, please call Customer Service:

France: 0825 045 645

Germany: 069 86798021

Italy: 848 845 645

Spain: 901 516 645 Option 1

Switzerland: 0848 645 645

United Kingdom: 0870 900 4645

For other countries across Europe, please call: +44 (0) 115 943 0840

Or visit: www.merckmillipore.com/offices

For Technical Service visit:

www.merckmillipore.com/techservice



www.merckmillipore.com

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