neyco
VACUUM & MATERIALS

# Asbestos Analysis

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# Equipment

## SPI Plasma Prep™ III Plasma Etcher


The Plasma Prep III (PP III) is the new generation of the popular and long serving Plasma Prep II RF based unit. With its compact tabletop design and ease of use, the new generation now employs a solid state design to deliver the same 100W system performance. Furthermore, the small footprint allows the system to fit neatly in most any laboratory environment.

***Why Solid State?***

The PP III design is based on the popular PP II system and one may wonder why one should consider buying the solid state version of this tube system. The purpose to build such a system was twofold.

1. With a decreasing inventory of RF tubes and unreliable sources of RF tubes for our current PP II design, there may come the day when we will no longer be able to provide tubes for new systems as well as units in the field. While we do not see this occurring for quite some time, and our inventories are high, the introduction of a solid state unit allows for the choice and the transition to a solid state unit.
2. The RF tube system gives stability that is quite good; however, it is to some degree limited. The PP II system typically the unit runs at 60 to 100W and down to perhaps 30 watts. However, at that lower range, it is more difficult to maintain a stable power level. The PP III Low Power system provides the ability to have greater control in these lower power ranges, running from 1 to 10 watts. Now with the PP III, you can run your system from 1 to 100W with great stability and ease of use. So for those end users who are looking for power levels other than full power, this system may be better suited for you.

***Incorporated Vacuum Gauge***

The PP III has an internal vacuum gauge as part of the system, no longer needing an external vacuum meter to monitor or diagnose the system.

***Features:***

- Flexible range. Capable of 1 to 100 W operation
- Greater stability
- Reproducible conditions.
- Same small footprint as the PP II (10.5" H X 14.75" W X 12" D measurements)
- Integrated vacuum gauge
- Measurement and adjustment of forward and reverse power
- Digital metering
- 110/220 V compatible
- 4" diameter x 6" depth Pyrex or Quartz Chamber

| P/N | Designation |
|---|---|
| **11055-AB** | Plasma Prep™ III Plasma Cleaner (110 V) |
| **11055-AX** | Plasma Prep™ III Plasma Cleaner (220 V) |

| Option |
|---|
| Vacuum pump 5m3/h |
| Oil mist filter |

***Who would use this system***

The basic functions and use of the PP III is identical to that of the PP II. For those users who have long process times (in terms of tens of hours to days) the solid state unit provides for excellent stability so that the user can run the system overnight without concern about a change in operating conditions.

For those with or looking at multiple systems, the PP III allows easy adjustment of system conditions so those units in the same laboratory, or even those in different locations can be run in a similar fashion. Of course, there still remain a number of external variables that may affect these systems including gas and gas pressures and difference in line voltages.

The PP III operates at 13.56 MHz operation. It is CE Certified and RoHS Compliant.

The unit can quickly be set up in your laboratory. You will need a mechanical pump. We recommend the Leybold D4B which is our Fomblin filled 2-stage mechanical pump with an oil mist filter. This will complete your system. Add your tank of process gas and hosing to the gas inlet and you are ready to run your system.

The PP III has one gas input though an optional gas manifold is available. Many gases and gas mixtures may be used including oxygen, argon and carbon tetrafloride. Quite a bit is known about what plasma chemistry is needed to etch different materials.

## SPI Plasma Prep™ III Process Controller

The Plasma Prep III Process Controller is a module add-on that gives greater versatility to the Plasma Prep III asher/etcher system or the Plasma Prep III Plasma Cleaner. With this module, a user can now:

- Control a gas flow rate to adjust the pressure in the PPIII
- Select two inputted gasses and mix them proportionally for use as the input gas to the PPIII system.
- Run the Plasma Prep III for a desired time

The Plasma Prep III Process controller should be considered by those that are in need of:

- Reproducible run times for R&D and production
- Multiple gas sources
- Variable mixing of two gases

The small module size fits neatly on the Plasma Prep III frame and easily connects to the system. Two gas inputs allow for control of the pressure and potential mixing of two gasses through high precision flow meters. A membrane pad allows for easy input of process time (seconds, minutes, hours), memory storage and recall, and interlock functions which enables the process controller to interface and run the Plasma Prep III. The controller enables the Plasma Prep III to run a cycle after which the system will turn off the RF power and isolate the specimen chamber. This allows for a reproducible cycle for multiple runs in experiment or production.

**Dimensions:** Width 9.5" (241 mm) x Heigth 7" (177 mm) x Depth 10.5" (266.7 mm)

**Power Supply:** 110/220 Volts

| Ref | Designation |
|---|---|
| **11052-AB** | Plasma Prep™ III Process Controller (110 V) |
| **110502-AX** | Plasma Prep™ III Process Controller (220 V) |

## SPI Plasma Prep™ III Plasma Cleaner

### For cleaning of TEM specimen holders and samples!

The SPI Plasma Prep™ III Plasma Cleaner is a compact "bench top" sized plasma cleaner, that uses the "dry plasma process" for the removal of contamination on the TEM specimen holder. The unit can also be used on the sample itself, whether in regards to the cleaning of the sample, or exposing it to a glow discharge process.

The unit is the same type of plasma cleaner instrument that was used by Dr. Nestor Zaluzec in the discovery that if this kind of contamination is removed, the contamination rates on samples are greatly reduced, and therefore, one sees a significant increase in the contrast and over all quality of the data in the final TEM image. Now this unit has been upgraded to the solid state technology for even better control over the power needed. SPI Supplies manufactures and offers for sale plasma cleaning equipment for this purpose according to the terms of a license agreement granted by Argonne National Laboratory.

### Special features:

Capable of 1 to 100 Watt operation with most work done in the 1 to 10 Watt range. This low wattage allows operation with argon without having deleterious impact on either the specimen holder, rod, or the specimen itself. This low power is enough to dislodge surface held contamination but not enough to actually "etch" the sample or rod or holder assembly.

Barrel type design for isotropic plasma cleaning which is the ideal geometry of the plasma to get into the various "nooks and crannies" of the specimen holder and contact areas between the specimen itself and the holder assembly.

Air vent bleed control valve: Allows operator to precisely control the rate of air flow when venting to the chamber. A sudden rush of air could disturb a fragile sample. The valve is easily accessible inside the cabinet of the plasma cleaner but discourages the changing of the bleed rate

Compact, Efficient Design: Small footprint, with room inside to process samples in batch quantities. Dimensions: 10- 1/2" (26.7 cm) H x 14-3/4" (37.5 cm) L x 12" (30.5 cm) W; chamber is 4" (10.15) internal diameter, 6" (15.25cm) deep.

Highly portable: Weight is only 32 lbs (14.5kg), not including the weight of the separately installed rotary ("mechanical") pump.

## Make sure you appreciate the following:

Sometimes there is some confusion of the terminology, that is, what is a plasma etcher vs. what is a plasma cleaner. Generally speaking, a plasma etcher is a unit that operates at 100 watts or higher but a plasma cleaner operates at power levels perhaps as low as 1 watt and is designed to "tickle" the top surface of anything it sees. So for the purpose of removing thin adsorbed layers of contamination on a TEM foil sample for example, or on the sample holder itself, a low power plasma cleaner will do the job just fine. Indeed, using argon for example, at higher power could actually "etch" and cause damage to the metal parts of the microscope stage.

The Plasma Prep™ III Plasma Cleaner is based on the same design as the Plasma Prep™ III solid state system. If your application is to remove photoresist, for example, from a silicon wafer, then what you really do need is a plasma etcher capable of running at 100 watts and so we would recommend our SPI Plasma Prep™ III unit (this also has a larger chamber access).

## Operation is simple...

Insert the rod and holder assembly into the glass reaction chamber, introduce your choice of gas, either oxygen or argon (depending on the specimen being examined), to the base pressure of approximately 250 mTorr and apply RF power (13.56 MHz) to the chamber. This excites the gas molecules present to a highly reactive plasma state. At the 10 watt operation level (or less), the plasma will easily be able to remove the slightly held contamination that is responsible for loss of contrast and image quality in most TEMs. For those looking to work with two gases or a mixture of the two, please see our Plasma Prep™ III Process Controller for more information on this added module.

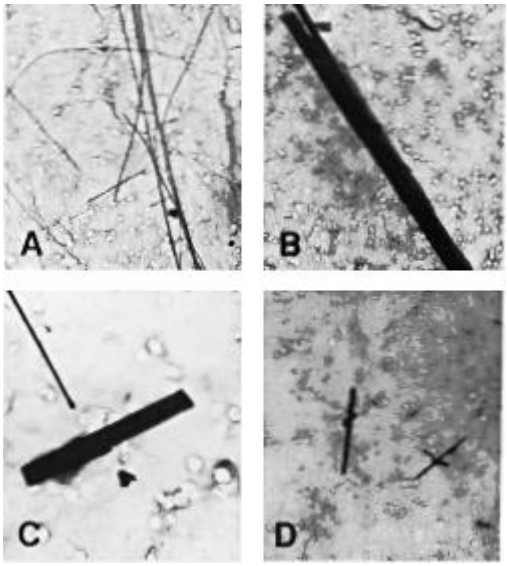
For those who have a Plasma Prep III or those considering the purchase of this system, one can consider obtaining the Plasma Prep III Plasma Cleaner Module. This kit would enable a user to change the front piece going from the standard Plasma Prep III to the Plasma Cleaner for TEM Specimen Holders.

## Plasma Prep™ III Plasma Cleaner

Including special front end accommodation port for the rod of your choice and everything else needed for operation of the unit as described above.

# UICC Asbestos Standards **Union Internationale Centre le Cancer*

**Take the uncertainties out of your experimental data and compare with known controls!**




These standard reference asbestos (UICC)* samples "(chrysotile, amosite, anthophylite, crocidolite)" are packaged in 0.1 g vials. (That may not sound like much but it is a considerable amount!). For most, it is a "lifetime" supply. These standard samples were developed specifically for calibration, testing, or reference specification for comparison with unknown materials. Use as "knowns" for SAED, EDS, XRD, and for morphological standards for TEM and SEM and sometimes even for LM. However we are unable to issue a Certificate of Conformity for these unique standard samples. SPI Supplies is the exclusive worldwide distributor for these five, one-of-a-kind standard asbestos samples.

But we can state that the origin of these five very unique and specially characterized samples was Dr. V. Timbrell, Pneumoconiosis Research Unit, Llandough Hospital, Penarth, Glamorgan, United Kingdom with the shipment being made in early 1972.

The trace element compositions of the UICC standard asbestos samples are reported in **American Journal of Industrial Medicine Volume 32**, Issue 6 , Pages 592 - 594, Published Online: 6 Dec 1998.

The five samples are described as follows:

### Chrysotile "B" Canadian

NB #4173-111-1

This sample consists of a mixture of fiber from the firms Bells, Carey, Cassair, Flintkote, Johns-Manville, Lake, Normandie and National, proportioned roughly to represent Canadian production of asbestos products at that time. All starting materials were Grade 4 on the Canadian scale or the nearest equivalent, the goal being to obtain material of relatively short fiber length but with a minimum of "rock". For further information, see Timbrell, Gilson and Webster, **Int. J. Cancer 3, 406-408 (1968)**. This mineral is predominantly made up of hydrous silicates of magnesia.

### Chrysotile "A" Rhodesian

NB #4173-111-2

The origin of this sample was the asbestos mine located in Zvishavane (Shabani; Shavani), Matabeleland South, Zimbabwe. This mineral is predominantly made up of hydrous silicates of magnesia.

### Crocidolite South African

NB #4173-111-3

The origin of this sample was the Koegas mine which was the largest asbestos mine in the Northern Cape of South Africa. This mineral is predominantly made up of hydroxy silicates of Na, Mg ,and Fe.

### Amosite South African

NB #4173-111-4

The origin of this sample was the Penge mine in Northern Province, South Africa. It exhibits a lamellar, coarse to fine structure, which is fibrous and asbestiform. It consists of hydroxy silicate of Fe and Mg.

### Anthophylite Finnish

NB #4173-111-5

The origin of this sample was the Paakilla mine in Finland. This type of asbestos only rarely found in construction materials. The fibers seem to be extremely flat and thin with a characteristic shape that resembles that of a knife blade, coming to a point at one end.

For further information on the use of the standards, we would suggest reading the following: J. L. Hutchison, M. C. Irusteta and E. J. W. Whittaker, High-resolution electron microscopy and diffraction studies of fibrous amphiboles, **Acta Crystallographica, Vol. A31**, Part 6, November (1975), p.974-801.

### Special note for those contemplating asbestos analyses:

We always want to remind anyone planning to do their own analyses, at least in the USA, that there are US government approved procedures for

- TEM (NIOSH 7402)
- XRD (NIOSH 9000)

SPI Supplies also offers the analyst a full range of standards for microanalysis for EDS and WDS being done in an SEM or WDS being done in a free standing wavelength dispersive electron probe microanalysis system.

### Packaging:

All five asbestos standards are available in glass vials.

| Description | CAS # | Size | P/N |
|---|---|---|---|
| Chrysotile "A" Rhodesian | 12001-29-5 | 0.1 g | **02701-AB** |
| | | 1.0 g | **02701A-AB** |
| Anthophylite Finnish | 17068-78-9 | 0.1 g | **02702-AB** |
| | | 1.0 g | **02702A-AB** |
| Amosite South African | 12172-73-5 | 0.1 g | **02703-AB** |
| | | 1.0 g | **02703A-AB** |
| Crocidolite South African | 12001-28-4 | 0.1 g | **02704-AB** |
| | | 1.0 g | **02704A-AB** |
| Chrysotile "B" Canadian | 12001-29-5 | 0.1 g | **02740-AB** |
| | | 1.0g | **02740A-AB** |

# Grid

**Calibrated Asbestos Index Grids For AHERA Requirements**

Each package includes:

- 1000 Asbestos Index Grids (10 vials of 100, you select the type - all 200 mesh copper)
- AHERA-Required Documentation of Open Area Calibration

Not Everyone Needs "Calibrated" Grids:

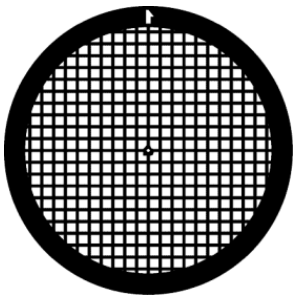
Everyone doing asbestos TEM work does not need to purchase (or use) "calibrated" grids; it is something needed primarily by those doing work that must confirm to the AHERA specifications. For all others, these same grids are available, for a much lower price, uncalibrated.

| **Regular** | **SuperGrid™:** | **Slim Bar®:** |
|---|---|---|
| 55% open area | 77% open area | 84% open area |
| 30 µm bar width | 20 µm bar width | 10 µm bar width |
| 95 µm grid square | 105 µm grid square | 115 µm grid square |
| **P/N 2270C-QC** | **P/N 2280C-QC** | **P/N 2290C-QC** |

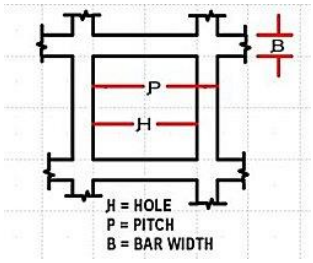
Trained technicians in our own laboratories use the fast and accurate SPI-QuantII™ Image Analysis System to measure 20 grid openings on each of 20 randomly selected grids (two from each vial of 100).

Each package of 1000 grids is inspected to assure "zero" defects, and comes with documented results from the calibration of these 400 grid squares. This is provided as an average measurement with standard deviations in a format suitable for inclusion in your AHERA Quality Control notebook.

**Regular grids for TEM : G200**



| | |
|---|---|
| Mesh (lines/inch) | 200 |
| Pitch µm | 125 |
| Bar Width µm | 35 |
| Hole Width µm | 90 |
| **Rim Specifications** | |
| Rim width (mm) | 0.225 |
| Centre Mark | Asymmetrical |
| Rim Mark | Yes |
| **Thickness** | 20 µm ± 3 µm |
| **Packaging** | 100 Grids/Vial |




| Ref | ITEM |
|---|---|
| 2020C-XA | Copper |
| 2020N-XA | Nickel |
| 2020G-XA | Gold |
| 2020P-XA | Pd on Copper |

# SPI Supplies® Brand TEM Grid Storage Boxes

**Select from two entirely different styles: Slide-A-Grid™ box and the Twist-A-Grid™ box.**

Our experienced in-house TEM operators and grid makers won't touch any other grid boxes except these two boxes that carry the SPI Supplies name! Use the SPI Slide-A-Grid™ box for up to 100 grids and the new SPI Twist-A-Grid™ box for up to 50 individual grids. Note that the new Twist-A-Grid box, for the first time, is designed for stacked storage. Both boxes are available numbered or unnumbered.


These two SPI Supplies Brand TEM grid storage boxes are our most often asked for grid storage boxes. The original box was known worldwide as the SPI Slide-A-Grid Storage Box and the new Twist-A-Grid TEM grid storage boxes is being widely accepted an improvement in design because of the stability feature. Each box holds either 100 or 50 3.05 mm TEM grids in a combination of number/letter coded compartments. Each box is accompanied by a record card for the convenient logging and indexing of your stored (or waiting-to-be-looked-at grids). So far as we know, this box is compatible with virtually all 3.05 mm (e.g. nominally 3 mm) TEM grids, including the unique SPI Silicon Nitride Membrane Window Grids.

**Note these advantages over grid boxes from other manufacturers:**

***Anti-static Plastic:***

The plastic formulation used is straight out of the aerospace and electronics industries greatly reduces tendency of the grids to jump out of or stick to the slots in the box.

***Numbering System:***

A unique numbering system is available to uniquely identify each Slide-A-Grid or Twist-A-Grid box from any other grid box, since no two boxes carry the same number. Any particular row of grids can be selected using the slot in the clear PVC see-through cover.

***Note When Ordering:***

Be sure to select between the "numbered" vs. "unnumbered" varieties of boxes. Generally speaking, the numbered boxes are slightly higher in cost than the boxes without numbers.

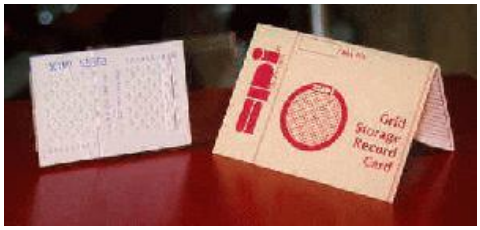
***Special Note on the Numbered Boxes:***


For quantities purchased in multiples of five boxes, they are packaged five per bag, and within a bag, the boxes are uniquely and sequentially numbered. We can not supply sequential numbering for more than any five boxes, that is, a second bag of five will be sequentially numbered, but would be of a different sequence from any other bag. For a purchase of a bulk box of 250 boxes, within that entire box, will be 250 boxes sequentially numbered.

***Grid Record Keeping Card:***

Each SPI Slide-A-Grid™ Storage Box is accompanied with a convenient grid record keeping card and a plastic polybag for safe storage. This is true for when the boxes are sold individually or in bulk packaging.

**SPI Slide-A-Grid™ Storage Box:**




| P/N | |
|---|---|
| **02450-AB** | Numbered Boxes |
| **02445-AB** | Unnumbered Boxes |

**Pack of 10 Numbered Boxes:** Sequentially Numbered

| | |
|---|---|
| **02449-BA** | Numbered Boxes |

**Bulk Pack of 250 Numbered Boxes:**

| | |
|---|---|
| **02450B-AB** | Sequentially Numbered |

### SPI Twist-A-Grid™ Storage Box:

The new Twist-A-Grid storage box is designed for the routine handling and long term storage of 50 standard size TEM grids. This new ergonomic design incorporates several features that overcome the disadvantages associated with storage boxes of the more conventional 'sliding cover' design. The numbered version has a unique number on the face and one end. There is slight additional cost associated with the numbering so the numbered boxes cost slightly more than the same box without the numbers.

### *Features:*

- The blue arrow at the 12:00 o'clock position indicates the park position for the cover when not in use. This is a firm 'click' position and cannot be moved accidentally, preventing spilling of the grids.
- The clear cover can be rotated smoothly through 360° once the slight initial resistance of the park position has been overcome exposing a maximum of 2 or 3 diamond shaped holes at any one time.
- The materials have been chosen for their anti-static properties, the clear cover also has self-lubricating properties which reduce friction, enabling the cover to move freely while remaining in close contact with the face of the base.

### *Grid Record Keeping Card:*

Each SPI Twist-A-Grid™ Storage Box is accompanied with a convenient grid record keeping card and a plastic polybag for safe storage. This is true for when the boxes are sold individually or in bulk packaging.

### *Specifications:*

**Size:** Length 75 mm x Width 65 mm x Depth 6.5 mm
**Weight:** 22 grams
**Materials Base:** ABS-PHAT (Acrylonitrile butadiene styrene with anti-static additive)
**Clear Cover:** CAB (Cellulose acetal butyrate)

| P/N | |
|---|---|
| **02447-AB** | Numbered Boxes |
| **02446-AB** | Unnumbered Boxes |

### Bulk Pack of 250:

Sequentially Numbered including record-keeping card and plastic polybag

| P/N | |
|---|---|
| **02447B-AB** | Numbered Boxes |

# Membrane

**SPI Membrane Filter Holders for Liquid Microfiltration. Available in clear polycarbonate or polypropylene plastic**

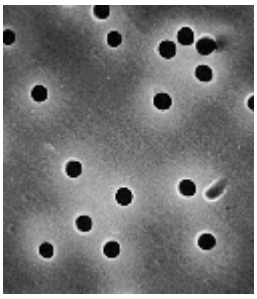
Easy-to-use plastic pressure holders for polycarbonate (SPI-Pore™ and Whatman/GE™), SPI Silver, and Anopore® membrane filters. For use in all applications, including syringe and vacuum or pressure devices.

| P/N | F0101-BA | F0102-BA | F0103-AJ |
|---|---|---|---|
| Materials | Polycarbonate | Polypropylene | Polycarbonate |
| Maximum operating temperature and pressure | 38°C (100°F) at 3.5 bar (50 psi) | | |
| Sterilization | 121°C (250°F) for 15 minutes | | |
| Size (cm) | 2.7 OD x 2.7 H | 3.5 OD x 3.7 H | 6.0 OD x 6.5 H |
| Membrane size (mm) | 13 | 25 | 47 |
| Prefilter size (mm) | 10 | 22 | 42 |
| Filtration area (cm2) | 0.8 | 3.9 | 13.8 |
| **Connection** | | | |
| Cap | Male luer slip-fit | Female luer-lok | Female luer slip-fit |
| Base | Female luer slip-fit | Male luer slip-fit | Male 1/4" NPT and 1/4" tubing (multipurpose) |

***Clear polycarbonate plastic for general use:***

| P/N | Size | Packaging |
|---|---|---|
| **F0101-BA** | 13 mm | Pkg/10 |
| **F0102-BA** | 25 mm | Pkg/10 |
| **F0103-AJ** | 47 mm | Pkg/10 |

# Standard White Polycarbonate "Track Etch" Membrane Filters



### Choose from both SPI-Pore™ and Whatman/GE™ brands

SPI Supplies offers polycarbonate membrane filters of two different types, SPI Supplies own brand of polycarbonate filters and the Whatman/GE™ brand. Click here to become familiar with some of these unique and innovative manufacturing techniques.

Typical applications include:

- Microfiltering of reagents, staining fluids or water prior to critical EM preparative techniques for ultramicrotomy.
- Direct observation by SEM of cells, cell organelles, fibers or contaminating particles removed from fluids.
- Ideal substrates for cell growth as a cell culture plate insert. The cells do not grow "into" the membrane, they remain at all times on the surface, making them easily removable. Liquid nutrient flows easily through the pores, giving the growing cells constant access to food. And, the cellscanbeeasilyplated.

### General Specifications

Extensive information for the SPI-Pore brand is available relating different pore sizes to pore density, membrane thickness, weight, bubble point and flow rates. The guarantee on the pore size is +0%, -20%. For example, 0.6µm pore size on a membrane filter can actually have a pore size as small as .48mm but still be considered as being within the 0.6µm product range. And a 0.6 µm product can never have a pore size larger than 0.6 µm. A 0.4µm pore size product cannot ever have a pore size larger than 0.4µm. And so on.....

### Pressure specifications:

With regard to the SPI-Pore™ Membrane Filters, we guarantee they will withstand pressures of at least 2000 psi when properly supported. When a membrane filter is being used in a high pressure filter holder, claim to see use pressures well in excess of 2000 psi. If the membrane is not properly supported, expect to "burst" with as little as 15-20 psi.

### Optical properties:

The SPI-Pore membranes are opaque and white after etching (the starting film is transparent) because the pores refract light. PC film itself has a crystalline structure with a dual refractive index. So the light gets bent a few times as it passes through the membrane with the pores resulting in a white - opaque appearance. This is a visual, not physical or chemical change. The membrane can become clear again with either a clearing solution or a coating that cancels the effects of the light. One can also use special microscope slides of the Cyto-Clear brand, which have a coating that essentially cancels out the white color. The pores disappear when viewed under a light microscope. Most immersion oils can serve as a clearing agent without any problems, turning the membrane from being opaque and white to clear and transparent.

### Temperature limits of use

We recommend that these membrane filters not be taken above 140 °C (284 °F).

**Hydrophilic characteristics:**

Polycarbonate is inherently hydrophobic and in order to increase the wetability of the membrane surface all SPI-Pore membranes are given a final treatment with PVP (polyvinylpyrrolidone). Most customers prefer PVP-treated membrane filters. However for those who believe that the PVP could interfere with their experiments, the membranes can be requested without PVP treatment as well.

It is some times asked, just how hydrophobic is the untreated membrane surface? PCTE without PVP is not truly hydrophobic like PTFE or PVDF but it is much more hydrophobic than it is hydrophilic. We are unaware of any hard data that exists in the public domain that quantitatively defines this characteristic but we have heard of contact angle measurements being made in order to get a better feel for this characteristic.

**SPI-Pore vs. Whatman/GE™ Polycarbonate Track Etch Membrane Filters**

Since there is only one manufacturer in the world of the special liquid monomer from which the polycarbonate film material is made, the two brands of membrane filters are similar at the start of the process. But because different manufacturing processes are used different thicknesses of base material film are needed. For most pore sizes, the membrane thickness of the SPI-Pore membranes is thinner than the Whatman/GE™ brand. This has important implications on flow rates.

**Binding of macromolecules to the membrane surface:**

We are often times asked what is the affinity of nucleic acids molecule (DNA, RNA) to bind to polycarbonate membrane filter. The affinity is based strictly on the electrical charge on the PCTE membrane itself, be it SPI-Pore or Whatman/GE™. Either brand of PCTE is easily coated in order to increase affinity but other than that it is strictly based on how the DNA/RNA is affected by the intrinsic charge on the surface of the membrane.

**Holding the membrane filters:**

All membrane filters offered by SPI Supplies irrespective of their construction, must be used in conjunction with a specially made membrane filter holder

**Standard White Membranes**

**13mm (Package of 100 filters)**

| Pore Dia. | | SPI-Pore | Whatman |
|---|---|---|---|
| µm | nm | P/N | |
| 0.01 | 10 | E00153-MB | |
| 0.03 | 30 | E0033-MB | |
| 0.05 | 50 | E0053-MB | |
| 0.08 | 80 | E0083-MB | |
| 0.1 | 100 | E0113-MB | F0113-MB |
| 0.22 | 220 | E0213-MB | F0213-MB |
| 0.4 | 400 | E0413-MB | F0413-MB |
| 0.65 | 650 | E0613-MB | |
| 0.8 | 800 | E0813-MB | F0813-MB |

| Pore Dia. | | SPI-Pore | Whatman |
|---|---|---|---|
| µm | nm | P/N | |
| 1.0 | 1000 | E1013-MB | F1013-MB |
| 2.0 | 2000 | E2013-MB | |
| 3.0 | 3000 | E3013-MB | |
| 5.0 | 5000 | E5013-MB | F3013-MB |
| 8.0 | 8000 | E8013-MB | F5013-MB |
| 10.0 | 10,000 | | F8013-MB |
| 12.0 | 12,000 | E12013-MB | F10013-MB |
| 14.0 | 14,000 | E14013-MB | |
| 20.0 | 20,000 | E20013-MB | |

**25mm (Package of 100 filters)**

| Pore Dia. | | SPI-Pore | Whatman |
|---|---|---|---|
| µm | nm | P/N | |
| 0.01 | 10 | E00155-MB | |
| 0.03 | 30 | E0035-MB | F0035-MB |
| 0.05 | 50 | E0055-MB | F0055-MB |
| 0.08 | 80 | E0085-MB | F0085-MB |
| 0.1 | 100 | E0125-MB | F0125-MB |
| 0.22 | 220 | E0225-MB | F0225-MB |
| 0.4 | 400 | E0425-MB | F0425-MB |
| 0.65 | 650 | E0625-MB | F0625-MB |
| 0.8 | 800 | E0825-MB | F0825-MB |

| Pore Dia. | | SPI-Pore | Whatman |
|---|---|---|---|
| µm | nm | P/N | |
| 1.0 | 1000 | E1025-MB | F1025- MB |
| 2.0 | 2000 | E2025-MB | F2025-MB |
| 3.0 | 3000 | E3025-MB | F3025-MB |
| 5.0 | 5000 | E5025-MB | F5025-MB |
| 8.0 | 8000 | E8025-MB | F8025-MB |
| 10.0 | 10,000 | E10025-MB | F10025-MB |
| 12.0 | 12,000 | E12025-MB | F12025-MB |
| 14.0 | 14,000 | E14025-MB | |
| 20.0 | 20,000 | E20025-MB | |

**47mm (Package of 100 filters)**

| Pore Dia. | | SPI-Pore | Whatman |
|---|---|---|---|
| µm | nm | P/N | |
| 0.01 | 10 | E00157-MB | F00157-MB |
| 0.03 | 30 | E0037-MB | |
| 0.05 | 50 | E0057-MB | F0057-MB |
| 0.08 | 80 | E0087-MB | F0087-MB |
| 0.1 | 100 | E0147-MB | F0147-MB |
| 0.22 | 220 | E0247-MB | F0247-MB |
| 0.4 | 400 | E0447-MB | F0447-MB |
| 0.65 | 650 | E0647-MB | F0647-MB |
| 0.8 | 800 | E0847-MB | F0847-MB |

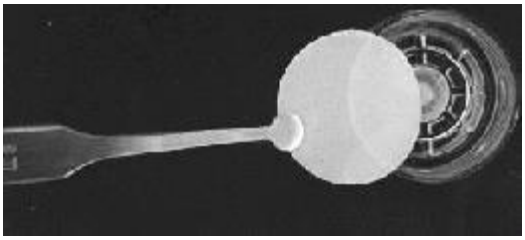
| Pore Dia. | | SPI-Pore | Whatman |
|---|---|---|---|
| µm | nm | P/N | |
| 1.0 | 1000 | E1047-MB | F1025- MB |
| 2.0 | 2000 | E2047-MB | F2025-MB |
| 3.0 | 3000 | E3047-MB | F3025-MB |
| 5.0 | 5000 | E5047-MB | F5025-MB |
| 8.0 | 8000 | E8047-MB | F8025-MB |
| 10.0 | 10,000 | E10047-MB | F10025-MB |
| 12.0 | 12,000 | | F12025-MB |
| 14.0 | 14,000 | E14047-MB | |
| 20.0 | 20,000 | E20047-MB | |

# SPI Membrane Filter Tweezers

**The "ultimate" membrane filter pick up device**

Ideal for asbestos sample preparation. Rounded "pads" with electropolished finish won't damage delicate membrane filters: plus, they allow the grasping of the very edge of a filter so as not to disturb the active sample area. Tips are fabricated from the unique SPI Supplies Miracle Tip™ super alloy that is 100% anti-magnetic. Particles won't "jump off" the membrane filter onto tweezer tips. And the Miracle Tip™ alloy is much more corrosion resistant than the so called antimagnetic stainless steel. Completely autoclavable too. From the SPI Swiss.

**Length:** 115



***Picking up a membrane filter***

***Both styles next to membrane filter***

| P/N | |
|---|---|
| **01580-AB** | Straight |
| **01581-AB** | Curved |

# Preparation

## SPI Die-Cut Carbon Conductive Double Sided Adhesive Discs

Offering only high purity adhesives suitable for analytical and other applications

### Double sided adhesive carbon discs, 12 mm diameter

The SPI double sided adhesive carbon filled conductive discs combine both high purity and an almost coverglass smoothness to the sticky surface. In addition, the die-cut discs bring a high level of convenience to the SEM user who can order discs of the precise size needed for their respective SEM mounts. Furthermore, one will never see a static charge on the discs which makes for easy mounting of dry powders. Nothing could be easier to use than the SPI conductive double sided adhesive carbon discs.

For those doing AFM, non-conductive discs might be the preferred adhesive mounting system.

The original SPI Supplies Brand® Discs:

Originally developed for the SEM user, in sheet and tape form, SPI started to receive requests for these products not just as die-cut discs for SEM, but also for very large discs for other applications, such as settled dust studies in clean rooms, environmental studies involving the outdoor collection of fly ash and other particulates, including pollen and other air borne dusts. We are sometimes asked about the temperature range of use. We would be reluctant to recommend use above 130° C (266° F) outside the SEM or use within the SEM over 100°C. After heating, the adhesive will have lost its "tac" for holding something new but anything already being held should retain at last some of its original adhesive strength. Above 140° C, the adhesive will start to decompose and convert to a carbonized residue.

For use at low temperatures, the adhesive bond should maintain its basic properties at least to -20° C(-4° F) and depending on the stress being put on the bond, it would be much lower in temperature as well. And a large number of users report that they use the carbon sheets in particular, for the mounting of samples for surface analysis.

### *A few words about purities and out-gassing:*

These are the two most important questions in the back of the mind of anyone contemplating the use of the SPI double-sided carbon discs in their work. Over the years, we have, without fan-fare, continually improved the disc, sheet and tape products, so that today, we can safely say that we are not aware of anyone who has been able to detect, by EDS, anything coming from the adhesive material itself. We are aware that at times, it has been reported that low levels of Si (coming from a release agent) can be detected by XPS. The discs are considered "UHV compatible" and there are no solvents or other volatiles that would come off the high vacuum of one of today's modern systems. It is because of the high purity of the SPI products that there is no discussion about trace elements that might be detected in an EDS system as is the case for similar appearing products offered by competitors.

### *The SPI Supplies UltraSmooth™ Double Sided Adhesive Conductive Carbon Discs:*

The biggest challenge for us at SPI over the years was to not only offer our customers discs with the purity approaching spectrographic purity (e. g. with a "clean" EDS spectrum), but the discs also had to be low enough in resistivity and also, it had to be reasonably beam stable and not decompose in

the beam. One can some time come across discs that feature claims for surface smoothness, but unfortunately, they are not high purity so one never knows for sure if an unexpected peak is due to their sample or from the disc being used. For example, discs that trace their progeny to the typewriter ribbon industry are well known to have impurity levels that would be quite upsetting to any discriminating EDS user! But now, as a result of considerable product development effort and product testing in our own instrumentation, we can offer the newest entrant to this class of products, the SPI Supplies UltraSmooth Discs.

While our regular (original) discs are quite smooth and meet the requirements of most of our customers, there are some who still prefer something smoother. And now we have it for them. But unlike with other "smooth" disc products, one does not have to suffer the trade off of either unwanted impurities in the disc or lack of stability in the beam.

**Note:** For ESD application, we recommend the original family of discs, they are just as good in this respect and furthermore they cost less money.

***Suggested storage conditions:***

For short term storage, that is, less than a year or so, room temperature storage is just fine. But if you have stockpiled a quantity, or have purchased a large amount to take advantage of quantity pricing, we would suggest storing the excess under refrigeration. These are organic materials and at room temperature can, under certain circumstances, start to lose some of their "tac". This is true of either type of disc, either the "original" products or the newer UltraSmooth™ carbon disc products.

***Removal of adhesive from SEM mount:***

Both types of carbon discs offered by SPI Supplies develop a surprisingly strong adhesive bond with the SEM mount surface and neither is removed that easily. Soaking in ethyl alcohol or isopropanol will help loosen the bond for a much easier removal but one should still be prepared to use a little "elbow grease" to get the mounts clean enough so that they can be reused.

***The Original SPI Supplies Brand Carbon Discs:***

Resistivity: < 5 ohms/5 $mm^2$
Adhesive family: Acrylic
Thickness: 0.16 mm

***For SEM, ESD, and other analytical applications:***

| P/N | Dia. of Disc | # Discs/sheet | # Discs/pack |
|---|---|---|---|
| 05073-BA | 9 mm | 44 | 440 |
| 05077-BA | 12 mm | 24 | 240 |
| 05074-BA | 25 mm | 8 | 80 |

***UltraSmooth™ SPI Supplies Brand Carbon Discs:***

Resistivity: < 5 ohms/5 $mm^2$
Adhesive family: Acrylic
Thickness: 0.16 mm

| P/N | Dia. of Disc | # Discs/pkg |
|---|---|---|
| 04966-BA | 9 mm | 100 |
| 04967-BA | 12 mm | 100 |
| 04968-BA | 25 mm | 54 |

**Storage conditions:**
Short Term: Room temperature
Long Term: Refrigerated

## SPI Supplies® Brand Conductive Double Sided Carbon Adhesive Tape

**Now available in five different tape widths and all on a clean white non-deteriorating plastic core!**

**Easy to use - Highly Conductive!**
These double sided adhesive, electrically conductive tapes were specially developed for attaching samples to be examined by SEM and/or EDS. A conductive carbon based product is recommended for EDS work where it is important to eliminate the x-rays coming into the detector from the substrate.

SPI Supplies Conductive Carbon Tapes, as well as being conductive and adhesive have almost no discernible structure and provide the ideal background against which to view your whole specimen. Use of the tapes also greatly reduces the background x-ray counts, giving greater accuracy and lower detection limits for your EDS work. Whether you are imaging or analyzing your specimen , the effect is just like dark field microscopy.

This extra narrow tape has been introduced to meet the demands of those working with UHV systems who want to reduce the amount of exposed organic surfaces in their systems. And many SEMs users will find the new narrow tape, in some ways, to be more convenient, than the wider tapes. Because we anticipate that this product will have wide use in clean environments and clean rooms, it is wound on a lint-free plastic core (instead of the more common paper based (and linting) core. All of the SPI carbon tapes are offered with this new white plastic lint-free non-linting core.

**SPI Supplies® Brand carbon tape features exclusive plastic core!**

Carbon tape is not all the same. Not only are the adhesives not all the same, but check out the cores. SPI tape has been wound onto a white plastic core so as not to generate particulates in a clean room environment. Compare the clean SPI tape with the unraveling and deteriorating cardboard core used by our competitors! And you don't pay extra for this value-added feature when shopping at SPI Supplies.


Note how cardboard core generates particles that can contaminate samples or a clean room.

**New application for the tape:**

It has been reported that the SPI Carbon Tape is the ideal adhesive for affixing an electrode to a STM sample holder. It has just the right "tac" and conductivity for this application.

SPI Supplies® double sided conductive carbon tape is not the same as the sheet product but on roll form. The surface has a slightly less perfect surface smoothness and the EDS spectrum is not as "clean" with respect to other elements.

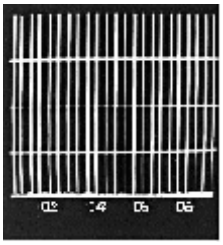
We are sometimes asked about the temperature range of use. We would be reluctant to recommend use above 130°C (266°F) outside the SEM or use within the SEM over 100°C (212° F). After heating, the adhesive will have lost at least some of its "tac" for holding something new but anything already being held should retain at last some of its original adhesive strength. Above 140° C, the adhesive will start to decompose and convert to a carbonized residue.

For use at low temperatures, the adhesive bond should maintain its basic properties at least to -20°C (-4° F) and depending on the stress being put on the bond, it would be much lower in temperature as well.

Just remember that SPI Supplies can not give any guarantees as to what kind of experience you will find in your particular application so be sure to do the appropriate level of testing should this be important to you.

Important advantages of carbon tapes:

- Enable the mounting of samples without contamination from either silver paint or carbon paint.
- Enable the mounting of highly porous or other absorbent samples without distortion caused by liquid being pulled into the sample.
- Provide good conductivity.



**EDS Scan of Carbon Tape**

**Suggested storage conditions:**

For short term storage, that is, less than a year or so, room temperature storage is just fine. But if you have stockpiled a quantity, or have purchased a large amount to take advantage of quantity pricing, we would suggest storing the excess under refrigeration. These are organic materials and at room temperature can, under certain circumstances, start to lose some of their "tac".

**Spool dimensions**

All SPI Supplies double sided adhesive conductive carbon tapes are shipped on 3" (76 mm) diameter plastic spools and can be dispensed from any standard tape dispenser for 3" tapes. Since we are the primary manufacturer of carbon tapes for ESD and microscopy applications, we can supply the tape on any size spool a customer might request (but with substantial minimum orders).

Carbon Conductive Double Sided Adhesive Tape
**Resistivity:** < 5 ohms/square
**Dimensions:** 8mm wide x 0.16mm thick x 20 meters long

Surface approaches cover glass smoothness and for UHV work, these sheets are considered UHV "compatible" because there is virtually no deflection of the vacuum reading when a control sample is inserted into a UHV system.

| P/N | Tape Dimensions |
|---|---|
| 05081-AB | 6 mm wide x 20 m |
| 05072-AB | 8 mm wide x 20 m |
| 05082-AB | 12 mm wide x 20 m |
| 05076-AB | 25 mm wide x 20 m |
| 05083-AB | 50 mm wide x 20 m |

**Storage conditions:**

Short Term: Room temperature
Long Term: Refrigerated