The Mass Spec Source™

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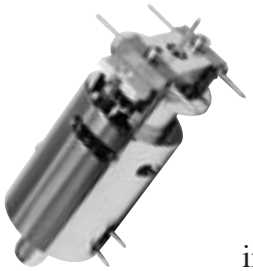
For Mass Spectrometry and Chromatography

Mass Spec Source Cleaning



This edition of the "Mass Spec Source" Newsletter is devoted to mass spectrometer source cleaning. The feature article in this edition, summarizes the experiences of the author in cleaning mass spectrometer sources over the past 30 years. The methods described are used by SIS in our labs to clean our sources as well as customer sources. The methods have evolved over the years based on our experiences as to what works best and also based on methods recommended by the mass spec manufacturers as well as the availability of new equipment and cleaners.

The Entire SIS Catalog is Available on Our Web Site *for On Line Ordering*

www.sisweb.com/catalog

You can now access the entire SIS catalog online.

Online Catalog Features:

- All pages of the catalog are online.
- The index pages are hyper linked.
- Hover your mouse over any part number to see price, quantity available, and discontinued status information on that part number.
- Click to add items to your shopping cart.
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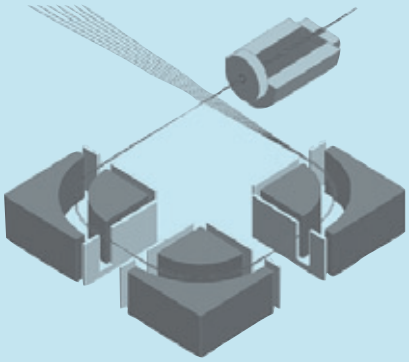
FEATURES

SIMION Web Site and Discussion Group

www.simion.com



SIS has established a new SIMION Web site with links to information related to SIMION. We have also set and will be monitoring a new SIMION users group. **See the back cover of this newsletter for additional details**.

CONTENTS

MASS SPEC SOURCE CLEANING KITS FROM SIS

The Major Kit

The Major kit includes most everything that is needed to clean a mass spectrometer source. The selection of felt polishing tips and fine abrasive polishing compound makes it fast and easy to clean contamination in the metal source parts. We have found the Micro Mesh abrasives included in the kit to be an excellent product for cleaning and polishing the metal parts and we use it extensively in our laboratory. The selection of other products listed below aid in cleaning and handling the small instrument parts.

Part No.	Description	Price
SK1	**Major MS Source Cleaning Kit**	$428.40
	Kit includes:	
1	Dremel Moto-tool kit	
1	Polishing compound	
5	Felt Polishing Tips	
12	Felt Polishing Wheel, 1/2" dia.	
5	Felt Polishing Wheel, 1" dia.	
2	Mandrels for Polishing Wheels	
1	Mandrels for Polishing Tip	
24	Pair of Nylon Gloves	
300	Clean Tex Cloths, 9" x 9" wipes	
2	Micro Mesh Abrasive Sheet Kit	
2	Micro Mesh Board	
500	Cotton Tipped Applicators	
1	600 Grit Aluminum Oxide	
1	Disposable Dust-Off XL	
1	Tweezer Set	
1	Six Piece Screwdriver Set	
1	Needle Nose Pliers	
1	Binocular Magnifier	
1	SIS Source Cleaning Instructions	

The Minor Kit

The kit includes Micro Mesh polishing cloths and boards for cleaning and polishing the metal parts. The kit also includes a selection of other products listed below to aid in cleaning and handling the small instrument parts.

Part No.	Description	Price
SK2	**Minor MS Source Cleaning Kit**	$191.76
	Kit includes:	
24	Nylon Gloves, Large, Case of 24 pair	
300	Clean Tex Cloths, 9" x 9" wipes	
2	Micro Mesh Abrasive Sheet Kit	
2	Micro Mesh Polishing File Board	
500	Cotton Tipped Applicators, pkg. of 100,	
1	4 oz. of 600 Grit Aluminum Oxide	
1	Disposable Dust-Off XL,	
1	Tweezer Set,	
1	Six Piece Jewelers Screwdriver Set,	
1	Binocular Magnifier,	
1	SIS Source Cleaning Instructions	

Terms and Conditions

Scientific Instrument Services (S.I.S.) continues to supply "The Mass Spec Source" newsletter as a service to our customers. Printed four times a year, it includes articles and notes on new products and procedures of interest to mass spec and GC users. Papers from all fields of scientific inquiry in which mass spectrometry and gas chromatography can play a role will be considered and subject to review. However, S.I.S. reserves the right to reject any article that is in direct competition with S.I.S. products.

Articles and Application Notes

Editorials and reviews on new instrumentation and techniques for GC/MS will be considered for publication. These articles may be any length and our Graphics Department will aid you in any way you may need.

Mass Spec Tips

Any new ideas or tips that could benefit other mass spectroscopists can be submitted for inclusion in this section.

For More Information

Anyone interested in writing in any of the areas above should contact the editor of the Mass Spec Source, at (908) 788-5550. We are always trying to improve this newsletter, if you have any suggestions please give us a call. Thanks for your continued support.

Warranty

S.I.S. does not warranty that the items described herein are usable or fit for a particular purpose. Our company makes no representation as to condition or character of the merchandise. S.I.S. will not be responsible for consequential or special damages.

"The Mass Spec Source"

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Mass Spectrometer Source Cleaning Methods

By John J. Manura - Scientific Instrument Services Inc.

The following is a compilation of the procedures used by Scientific Instrument Services for the cleaning of mass spectrometer sources over the last 25 years. This article incorporates the current techniques used at SIS as well as procedures reported in our Mass Spec Handbook of Service (published in 1983 and now out of print), articles published in back issues of the "Mass Spec Source Newsletter" as well as application notes published on the SIS web site (http://www.sisweb.com). These methods have been tested and modified over the years with the availability of new equipment and with the input from many other mass spectrometer users. In addition we have included several alternative techniques for the same operation, when these methods have been recommended by the instrument manufacturers. As a result this article provides for a comprehensive resource of techniques and methods for the cleaning of sources for most mass spectrometers.

This article covers the general service and cleaning of the mass spectrometer sources for a wide range of instrument models but may not be all inclusive. Most, but not all, of the metal parts in a mass spectrometer source can be cleaned by the following techniques.

When cleaning a mass spectrometer source, there may be components that cannot be cleaned or that must be handled carefully and without the use of any abrasive cleaning tools. Items such as alumina coated metal parts, gold plated parts, ceramic insulators, O Rings, Vespel insulators and other polymer components must be handled and cleaned by techniques which will not damage these components. Cleaning methods for these components are discussed at the end of this article. In addition, the specialized methods outlined in the instrument manufacturers' manual may have notes on how to handle these components. Check your instrument manufacturers' manuals for specific information on the cleaning of the mass spectrometer source and take note of parts which require special handling or alternative cleaning methods.

There is no regular schedule for cleaning the mass spectrometer source. The source should be cleaned when the mass spectrometer symptoms indicate that the source is contaminated. These symptoms include poor sensitivity, loss of sensitivity at high masses, or high multiplier gain during an auto tune.

The cleaning and service of the mass spectrometer source begins with the removal of the source from the vacuum housing, followed by disassembly, cleaning and polishing, washing and finally reassembly and testing. The various steps are outlined below and this article follows this general outline.

General Outline for the Cleaning of a Mass Spectrometer Source

I. Disassembly
II. Cleaning Techniques for Metal Parts
  A. Cleaning & Polishing Metal Parts
    a. Cleaning with buffing tools
    b. Cleaning with Abrasive Cloths
    c. Abrasive Powder Cleaning
    d. Sandblasting
  B. Washing Procedures
  C. Bake out and Drying
III. Cleaning Ceramic Insulators
  A. Abrasive Cleaning
  B. High Temperature Bake out
IV. Cleaning Vespel parts, O Rings and other polymers
V. Reassembly
VI. Filament Installation and Alignment
VII. Testing

I. Disassembly

Tools Required

a. Screwdrivers (a variety)
b. Small Pliers
c. Tweezers
d. Cleaning Cloths
e. Lint free gloves

Removal of the Mass Spectrometer Source from the Mass Spectrometer

This operation begins with the shutdown and venting of the mass spectrometer vacuum system. The mass spectrometer vacuum chamber must be at atmospheric pressure before the vacuum housing can be opened and the mass spec source removed.

CAUTION: ***All power to the mass spectrometer must be turned off and all vacuum pumps must be turned off. Allow the source to cool before beginning source removal.***

Depending on the manufacture and design of the mass spectrometer source and mounting system, the removal of the mass spec source from the vacuum housing can be easy or quite difficult. The difficulty usually occurs due to plumbing and electrical wiring of the source. For these difficult situations it is often advisable to check the manufacturers' manual to make sure that there are detail directions, schematics or photographs to demonstrate the removal process. If these are not available, it is advisable to take photographs of the source and mounting before you begin.

CAUTION: ***Take care not to get fingerprints or other contamination on any of the source, source mounting assembly or inside the vacuum chamber. Lint free nylon gloves should be used for all disassembly and reassembly operations.***

After the source has been removed from the mass spectrometer, it should be placed on a clean lint free cloth for the source disassembly operations.

Disassembly of the MS Source

After the source has been removed from the mass spectrometer it must be disassembled before cleaning is started. Again check the manufacturers' manuals for detailed drawings or pictures of the source assembly and disassembly. If this information is not available, then you should take pictures of the source before disassembly begins and at the various stages of disassembly. At SIS we often are asked to clean a source that is quite complicated. Before we begin we take digital photographs of the source from various angles and take additional photographs during the disassembly process. These color photographs have proved quite valuable when reassembling

the sources. In the photographs pay particular attention to electrical wire hookups and the orientation of parts on the source block. Also take note of the magnets and the orientation of the magnet poles on the source block. During the disassembly process, make notes on the photographs or drawings as needed. These precautions will save a lot of time in the future.

CAUTION: ***Use caution when removing thermocouples, heaters and other small delicate parts in the mass spec source. These parts are easily damaged during removal and may need to be replaced if damaged.***

Normally disassembly begins with removing electrical wire leads and connectors. Often the mass spec source can be removed from its mount by just disconnecting the electrical leads at the source itself. This is preferable since the lead will not need to be completely removed and its orientation and location will not be changed when the source is ready to reassemble. At other times it is necessary to completely remove the leads. It is important to note the location of each lead as well as its orientation so that it can be put back in the same relative position when reassembled.

CAUTION: ***Use caution in the removal of small screws from the mass spectrometer source. These screws can be easily broken off in the source body and not be repairable. If screws are stuck or frozen, do not force.***

If the manufacturer has disassembly instructions in the manual, they should be followed, otherwise parts are normally removed in a logical sequence from the outside to the inside. Use care in removing screws so as not to damage the screw head slots. If a screw is tight or frozen in position, do not force it. In this case other techniques may help such as the use of penetrating oil, putting the part with the frozen screw into an ultrasonic cleaner or heating the parts to try to unstick the screw. If a screw breaks off in the source block, it may not be repairable and a new source block may need to be purchased. The instrument shops at SIS have had some success in removing broken screws for our customers - so you can try us if you have no other alternative.

As the parts are disassembled, place the metal parts which will be abrasively cleaned in one beaker and the other parts such as ceramics, insulators, plastic parts and other parts which cannot be polished in a separate beaker.

Part Types	Cleaning Methods
Stainless Steel Parts	Abrasive cleaning including buffing and abrasive cleaning followed by solvent cleaning and low temperature bake out
Ceramic Insulators	Sandblasting, Acid Washing, Solvent Cleaning, Bake out
Berilium Oxide Insulators	Solvent wash followed by low temperature bake out
Oxide coated metal parts	Solvent wash followed by low temperature bake out
Macor Ceramics	Solvent wash followed by low temperature bake out
Vespel Insulators	Solvent wash followed by low temperature bake out
Gold Plated Parts	Solvent wash followed by low temperature bake out
O Rings	Solvent wash followed by low temperature bake out
PRT & Thermocouples	Low Temperature bake out

II. Cleaning Techniques for Metal Parts

The purpose of cleaning the mass spectrometer source is to remove deposits and contamination that can interfere with the mass spectrometer performance and prevent it from operating at optimum performance and sensitivity. The amount and degree of cleaning depends on the construction material of the source parts and their degree of contamination.

A number of techniques are available for the cleaning of the metal source parts. At SIS we have used a combination of polishing with motorized power tools and hand polishing with Micro Mesh abrasive sheets. For parts that may have stubborn deposits, we often use a small sandblaster with glass beads abrasives (but this is not normally needed). Other abrasive sheets have also been used (such as those sold by Agilent), but the Micro Mesh products are a finer grit and produce finer finishes on the stainless steel parts.

Parts of the source that come in contact with the sample or ion beam should be thoroughly cleaned as described below. However surfaces that do not come into direct contact with the sample (such as the source mounting brackets) do no normally need to be cleaned to the same extent, unless the contamination can contribute to the contamination of the source when it is reinstalled into the mass spectrometer. Normally just rinsing in solvent and drying is all that is required of these less critical parts.

Cleaning with Motorized Buffing

Tools Required

a. Supplies listed previously
b. Dremel Moto-Tool
c. Flat Buffing wheels
d. Polishing compound

Polishing and buffing stainless steel parts with a motorized buffing wheel is a quick and effective method for cleaning the residues off the stainless steel source parts and restoring the metal finish to a bright mirror finish. In our labs we have used the Dremel Moto-Tool, The Foredom Motor Tool and a small bench mounted buffing wheel. The Dremel Moto-Tool is a good choice for the laboratory because it can have many other applications in the instrument laboratory. Parts cleaned by the following techniques will be highly polished and will be free from fine scratches, which collect contamination rapidly and necessitate frequent cleaning. The initial cleaning may involve much time and effort. However the metal surfaces will stay cleaner longer (since the fine scratches in the metal surface which collect contamination are absent) and future cleaning will be much faster and easier.

The Dremel Moto-Tool is normally used with small felt buffing wheels mounted on a small mandrel. Polishing speed of 20,000 to 30,000 rpm are normally used for polishing parts. The buffing wheels are available in a number of shapes including 1" diameter disks, 1/2" diameter disks and small pointed cylinders for getting into corners. A fine metal finishing abrasive is used with the felt buffing wheel. The Dremel polishing rouge is a good general buffing abrasive, but other buffing abrasives are available from your local hardware store. Apply the abrasive paste in a thin film on the felt buffing wheel. Polish thoroughly to remove all carbon residues and scratches. When buffing parts, take care not to force the part into the buffing disc. Let the wheel and the abrasive do the work. When the cleaning appears to slow down, add more abrasive to the wheel. Polish the metal to a high luster. The more you polish, the more of a mirror like finish you will obtain.

CAUTION - SLITS - ***Be careful not to round the edges of slits and edges on the metal ion focusing plates on the mass spec source. Buff in the direction of the slit so as not to round the edges. On the edges of the slits buff lightly for minimal metal removal or preferably use the Micro Mesh polishing board.***

Cleaning with Abrasive Cloths

Tools Required

a. Supplies listed previously
b. Micro Mesh abrasive cloths
c. Micro Mesh polishing board

The shops at SIS have been using Micro Mesh abrasive cloths and polishing boards for many years to clean and polish the stainless steel source parts. The Micro Mesh is a cushioned abrasive on which the abrasive crystals float rather than remain in a fixed position on its backing. As a result the surfaces of the materials being cleaned will have minimal surface scratches from the abrasive as compared to other abrasive materials. The four finest grits (4000, 6000, 8000 and 12000) are normally all that is required for mass spec source cleaning. Use the courser grits to remove the carbon residue from the source and then use the next finest grit until you finish the source cleaning with the 12000 grit Micro Mesh. Using this product in this step like manner will produce a mirror like surface much like buffing above. The abrasive sheets can be cut into smaller pieces or folded to various shapes to fit the contour of the item being polished.

The Micro Mesh polishing boards are good for cleaning slits. Hold the slit perpendicular to the board while polishing. This will clean the slit edge, without rounding the edges of the slits.

Abrasive Powder Cleaning

Tools Required

a. Supplies listed previously
b. Aluminum Oxide (600 mesh)
c. Cotton swabs

Some of the instrument manufacturers recommend cleaning the source using an abrasive aluminum oxide powder. SIS sells a 600 grit aluminum oxide abrasive for this purpose. Use an abrasive slurry of the aluminum oxide abrasive with methanol or water. Cotton swabs work quite well with this abrasive slurry. These small cotton swabs enable the cleaning of corners inside the mass spec source. The only disadvantage of this product is that it is more abrasive than the previous techniques and the finished surface will not have a high metal luster. Courser abrasives are not recommended.

Industry Recommended Solvent Washing Sequences

SIS	Agilent	Thermo-Finnigan	Dupont
Mild Detergent	Methylene Chloride	Water	Water
Water	Acetone	Methanol	Isopropylalcohol
Acetone	Methanol	1,1,1-Trichloroethane	Toluene
Methanol			Ethyl Ether

Sandblasting

Tools Required

a. Supplies listed previously
b. Miniature Sandblaster with exhaust
c. Aluminum oxide abrasive, 400 grit

On occasion we have used miniature sandblasters to clean mass spectrometer sources. Normally glass beads abrasives are used at low pressures to remove stubborn residues from metal parts. Sandblasting is not normally used on the source stainless steel parts (and should never be used on source slit edges). However sandblasting works quite well in removing baked on carbon stains on metal surfaces and is frequently used to clean the ceramic insulators from the mass spec source. Several pieces of equipment for this purpose are described in the SIS catalog.

Washing Procedures

Tools Required

a. Supplies listed previously
b. Variety of glass beakers
c. Ultrasonic Cleaner
d. Detergent (Alconox or Mr. Clean)
e. Water or other solvents as required

After the metal parts have been cleaned and polished by the above procedures, they must be cleaned to remove all trace residues of the buffing compounds and abrasive materials. Normally solvents are used for this purpose. In the past many manufacturers have recommended the use of chlorinated solvents and toluene for this purpose. However we do not think that these solvents are necessary. The following procedure is used at SIS for washing instrument parts after cleaning. Below are listed some the solvent rinsing sequences reported by various manufacturers during the last 25 years

CAUTION: ***Hazardous Solvents. Protective equipment including safety glasses and rubber gloves should be used. All operations must be conducted in a laboratory fume hood.***

CAUTION: ***When washing the metal parts in the ultrasonic cleaner, do not let metal parts come in contact with each other. Part vibrating against one another may cause scratches on the surfaces of the parts. Do not leave parts in the ultrasonic cleaner for more than 5 minutes. If the parts are not clean in less than 5 minutes, other solvents may be required.***

First the parts are washed in an ultrasonic cleaner in water with a detergent. We have used both Alconox and the commercial cleaner Mr Clean for this purpose. The purpose of the first cleaning with detergent is to remove the buffing compound residues and other oil residues from the cleaning process. A toothbrush with the detergent solution can be used initially to remove the heaviest deposits of abrasive cleaning compounds. The parts are put in the ultrasonic cleaner and sonicated for at least two minutes. Repeat this process with several new solutions of the detergent until the parts are clean. Then wash the parts several times in the ultrasonic cleaner with clean water until no soap residues are present. Finally rinse the parts in Acetone to remove all water residues and do a final rinse in Methanol.

Baking and Drying

Tools Required

a. Supplies listed previously
b. Laboratory Oven
c. Gloves or tweezers

After the parts have been washed they are normally baked out in a laboratory oven at 100 to 150 degrees C for at least 15 minutes. If properly cleaned the parts should have no residues of cleaning materials and be spot fee. After the parts are allowed to cool they should not be touched with the bare hand. Use nylon or cotton gloves, lint free cloths and tweezers to handle all clean parts.

CAUTION: ***When parts are removed from the oven they are hot. Do not touch the parts until cool. Do not touch the parts with nylon gloves when hot or the nylon may melt onto the metal parts.***

When the parts are finished they should be placed on a clean lint free cloth and proceed with the assembly operations.

III. Cleaning Ceramic Insulators

Abrasive Cleaning

Tools Required

a. Supplies listed previously
b. Miniature Sandblaster with exhaust
c. Aluminum oxide abrasive, 400 grit

The preferred method for cleaning alumina ceramic source insulators at SIS, is to first sandblast the ceramics using 400 grit aluminum oxide abrasive in a miniature sandblaster. This technique will normally remove most carbon residues. After sandblasting, the parts should be blown off thoroughly to remove any abrasive residues and then rinsed in an Acetone bath. It is not recommended that ceramic insulators be cleaned in an ultrasonic cleaner since this may damage them. Finally the ceramic insulators are baked out in an oven at a temperature of at least 150°C. Because ceramics can adsorb solvents more readily than metal parts, they should be baked out for at least 30 minutes at 150°C.

CAUTION: ***Be certain that the ceramics you are cleaning are alumina ceramic. Do not sandblast Berilium ceramics (these are considered toxic) and do not sandblast Macor or other machinable ceramics because they are too soft and will be destroyed by the sandblasting procedure.***

When the parts are cool, they should be removed from the oven and placed on a clean lint free cloth.

CAUTION: ***When parts are removed from the oven they are hot. Do not touch the parts until cool. Do not touch the parts with nylon gloves when hot or the nylon may melt onto the metal parts.***

High Temperature Ceramic Bake Out

Tools Required

a. Supplies listed previously
b. Muffle Furnace
c. Miniature Torch

Another technique often used to clean ceramics is by baking them out in a muffle furnace at a temperature where they just begin to glow (about 1000°C) This will burn off any carbon residue. We have also cleaned ceramics by just heating with a miniature torch to accomplish the same results, but be careful to heat and cool the ceramics slowly with this technique so as not to produce a high thermal shock to the ceramics which will cause them to crack.

Other manufacturers have recommended cleaning of ceramics using a dichromate solution (which will turn the ceramics green in color) or by immersing in Nitric acid or aqua regia. We do not recommend either of these methods due to the hazards involved with these chemicals.

CAUTION: ***If acids are used in the cleaning of ceramics, all operations must be performed in a laboratory fume hood with the use of protective clothing, gloves and safety glasses. These operations should only be performed by individuals trained in the safe and proper handling of these chemicals.***

Cleaning Vespel Parts, Macor Ceramics, O Rings and other polymers

Tools Required

a. Supplies listed previously
b. Glass laboratory beakers
c. Ultrasonic Cleaner
d. Solvents - Methanol

Some of the parts in the mass spec source may include polymers and cannot be cleaned by any of the above procedures. Normally these parts are cleaned by immersing in Methanol in an ultrasonic cleaner for several minutes. Following this cleaning, the parts are put into an oven and baked out at 100 to 150°C for at least 15 minutes. If this does not clean the parts, they will need to be replaced.

V. Reassembly

Tools Required

a. Supplies listed previously

After all the parts are cleaned and baked out, the source should be assembled in the reverse order that it was assembled. Be sure to use nylon gloves and tweezers to handle all parts. Do not touch them with your bare hands. Assemble source on a clean lint free cloth. Assembly is always more challenging than the disassembly operation. It requires some dexterity and a good deal of patience to handle small screws and the source parts using tweezers and the jewelers screwdrivers. Use care to tighten all parts securely, but do not over tighten the screws as you may damage the screw head slots or make it impossible to remove.

VI. Filament Installation and Alignment

Tools Required

a. Supplies listed previously

The installation of the filaments and heaters is normally the last step before the source is installed back into the mass spec vacuum system. If the mass spec has a collector, it is often best to install the filament before the collector. One can then check the filament alignment by looking thought the ion exit hole where the collector would normally be. This is the optimum way to make sure the filament is perfectly aligned in the source.

VII. Testing

Tools Required

a. Volt Ohm Meter

After the source as been completely reassembled and the electrical leads installed. The components should be checked for continuity and leaks. The following components are normally checked with a volt-ohm meter using the resistance scale.

1. Resistance across the filament - normally 1 - 3 ohms (check your manual)
2. Source Heater - Normally 10 to 100Ω (check your manual)
3. Thermocouple Leads - Normally 1 - 3Ω
4. PRT Leads - Normally 100Ω
5. Filament to Source Block - Infinite resistance
6. Collector to Source Block - infinite resistance
7. Check all lenses to Source Block - normally infinite resistance (check your manual)

After all testing is complete the source can be reinstalled into the MS vacuum housing. After installation the above readings can again be checked at the lead ends where they exit the vacuum chamber. This will assure that the leads are properly connected.

If you have any comments on these methods or have any additional techniques, please let us know. We would like to hear from you and may include your comments in future additions of the newsletter.

Micro-Mesh® Cushioned Abrasives

An Ultra Fine Polishing Material for:

- MS & SEM Source Cleaning
- Polishing MS Probes
- Polishing Source Slits
- Removing Scratches from Plastics
- Polishing and Cleaning Metals, Plastics and Painted Surfaces
- Polishing Stainless Steel, Copper, and Aluminum
- Cleaning Mass Spec Quadrupoles

Micro-Mesh® Cushioned Abrasives

Cushioned abrasives are made in such a manner that the crystals are held in a resilient matrix as opposed to a hard resin, which will allow the crystal to recede when subjected to contact pressure.

In the case of Micro-Mesh products, there is a cloth backing upon which a Latex film is placed. Then various sizes of silicon carbide crystals are adhered onto the film.

What is unique about cushioned abrasives is that they do not give any random deep scratches. Instead, they produce an extremely uniform scratch pattern over the entire work surface. Cushioned abrasive products like Micro-Mesh have an extremely long life since the crystals are not subject to fracture or overheating. The crystals continue to cut effectively until they eventually become dull and lose their cutting edge.

Use Wet or Dry

Micro-Mesh may be used wet or dry and after you're done, it can be washed out and used again. Every sheet is color coded and has the grit written on its reverse side - the higher the grit number, the finer the cutting action. The variety of grits permit the restoration of most surfaces to a mirror finish.

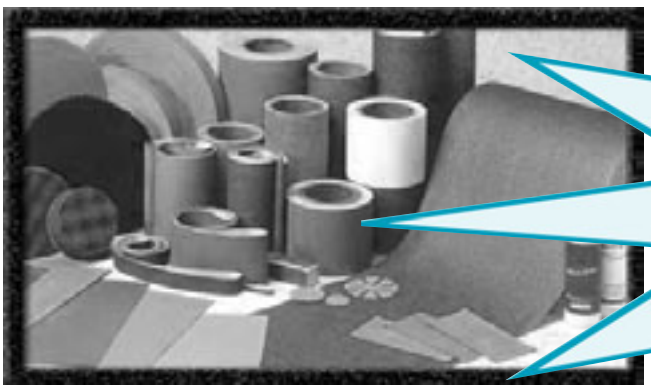
Micro-Mesh Polishing / File Boards

These polishing boards are ideal for getting into tight spaces, cleaning quadrupole rods, or for use in any other place where a stiff backing is preferable (They even make great emory boards!). Each polishing/file board has three different grits, 2400, 4000, and 12000 grits. They are used just like the Micro-Mesh sheets, starting with the coarsest area of the board and working to the finest area.

If you have parts and instruments that require precision cleaning, don't wait any longer to order your Micro-Mesh kit and polishing boards. It will save you time and money, and give you beautiful results.

Micro-Mesh® Polishing Kits

Part No.	Description	Price ea.
MMK-1	Kit of all 9 grits and one polishing board	$32.95
MMK-2	8 Finer grits (1800-12000)	$27.50
MMK-3	4 finest grits (4000-12000)	$14.25



New Micro-Mesh Kits As Well As Larger Sizes And Rolls Are Now Available. Visit Our Web Site at http://www.sisweb.com

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http://www.simion.com

The SIMION 3D Ion Optics Web Site and Users Group

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