TECHNICAL NOTE

SPI Supplies
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SPI-Pore™ Silver Membrane Media

Introduction

Made from pure silver, SPI Silver Membranes can withstand extreme temperature, pressure and solvents without collapsing, tearing, curling, or dissolving. More than tough, they are very smooth, extremely thin (.002" thick/51µm), and uniformly porous; they are also reusable (cleaned by oxygen isotropic plasma etching, ignition procedures, or sometimes just by simply back-washing). The most convenient if not also the best way for the cleaning for reuse of silver membrane filters is with the use of the SPI Plasma Prep II unit. The silver membrane filters are available from pore sizes of 0.2 to 5µm. For smaller pore sizes, one would need to use the aluminum oxide membrane filters.

Although the SPI Silver Membrane filters are used in a large number and variety of applications, their unique chemical and thermal stability is especially valuable for those applications involving aggressive fluids and/or high temperatures. They are ideal collection media for analysis of crystalline silica by x-ray diffraction and for analysis or organic materials by other instrumental techniques, such as the analysis of polyaromatic hydrocarbons (PAH). These are all in addition to the very popular and common application in the scanning electron microscope (SEM) laboratory since with a conductive substrate, one normally has a greatly reduced need to apply a conductive metal coating, something that can end up covering up important structure that otherwise would be resolved.

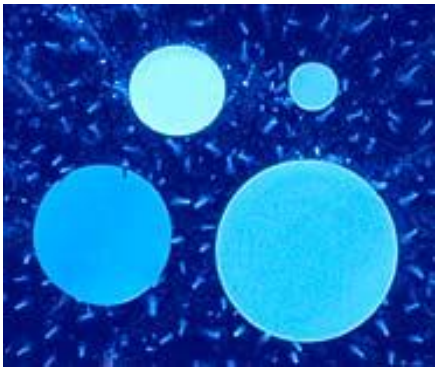

Figure 1. SPI-Pore™ Silver Membranes

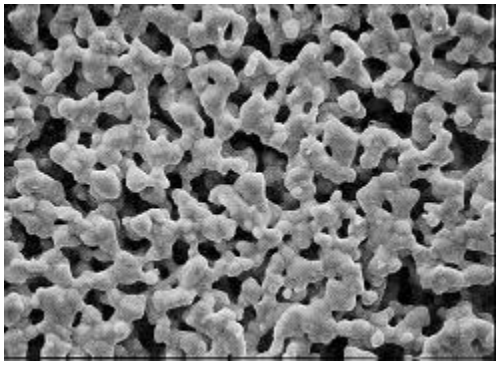

Figure 2. Scanning electron micrograph of surface of SPI Silver Membrane Filter. Horizontal distance is 60µm.

The silver membrane filters are also used for high temperature filtration, sterilization, removal of microbial and particulate contaminants from fluids, under pressure, and in caustic liquids and gases. (Note: Silver membranes are not resistant to nitric and sulfuric acids or cyanide solutions). The unique combination of physical properties and retention and flow rates for the SPI Silver Membrane filters have led to an enormous number of different and diverse applications.

Note for Life Science Researchers

You will find SPI Silver Membranes particularly useful for specimen preparation. Besides reducing the need to metallize specimens, they provide:

- Highly conductive surface for mounting, for SEM, including biological specimens, especially when being collected from suspension (e.g. individual cells or small groups of cells, small particles, etc.).
- Rigid support for direct SEM or LM viewing of specimens
- Critical point drying substrate (behaves like a polymer membrane filter) of collected particular samples for later viewing, on the filter, by SEM (or LM).
- Conductive surface often times leads to reduction or elimination of need for conductive metal for SEM observation, an advantage of particular importance to the life sciences researcher.
- Excellent heat transfer surface for dimensional preservation of specimens during freeze-drying.
- Bacteriostatic properties

Other Research Applications:

- Filtration of alcoholic beverages
- High temperature processing of viscous materials
- Performing mild chemical digestion directly at filter surface
- High temperature stack sampling
- High temperature sterilization procedure
- Filtration involving organic solvents

Some special comments directed to SEM applications

The silver membrane filter, after the particulates to be examined have been collected, and if from a liquid, allowed to dry, has to be mounted on an SEM mount. We would recommend against using silver paint, because the liquid, by capillary action, would "wick" up into the membrane, possibly changing some of the collected particulates or at the very least, confusing the observation of the particulates by contaminating the collected particulates with silver colloid.

Instead we would recommend using the SPI Supplies brand double sided conductive adhesive tape or the SPI Supplies brand double sided conductive adhesive carbon discs.

Asymmetric membranes

The two sides of the membranes are not the same. One side is clearly "shinny" and the other has a more "dull" appearance. And the two sides have definitely different surface properties. For applications in SEM, we believe that most users will get better results using the shiny side. But for x-ray diffraction and other applications, the dull side is generally preferred.

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.

Storage and shelf life

So far as we know, there is no real "expiration date" for the SPI-Pore silver membrane filtration media. However, we also know that oxides and other extraneous compounds can form with time depending on the environment in which the silver membranes are stored. Such silver compounds which may form on the surface are primarily cosmetic in nature and do not affect

the pore structure or membrane filtration performance. However, since nothing is forever, we have put an expiration date of five years onto the SPI Pore Silver Membrane Sheets. There should be at least three years remaining before this somewhat arbitrary determined expiration date in order to make sure that there is some time limit to which one could expect the performance to be as if they were brand new membranes.

Product availability

The SPI-Pore Silver Membrane Filtration Media is available in both disc and large sheet format. The discs are die-cut and in ready-to-use form with any standard disc filtration apparatus (e. g. funnels, cannisters, etc.). The large sheet format is offered for those needing custom cut sizes and who would find it more economical to do their own small quantity cutting in their own facilities.

Revised by: Junhang Luo

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