

QUANTIFOIL HOLEY CARBON FILMS



SPI Supplies
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Quantifoil Grids - Product Information



Selecting the Right Quantifoil for Your Needs

Quantifoil is a perforated support foil with a precisely pre-defined hole size, shape, and arrangement. The use of these support foils as "support films" on TEM grids offers a number of advantages not only for conventional transmission electron microscopy (TEM), but also for low-energy point source (LEEPS) microscopy when compared with conventional holey carbon support films.

The perforated foil is used to bear an ultra-thin carbon support foil or to directly support a large sample object, such as μm sized powder particle, which could be important when doing either electron diffraction (ED), electron energy loss spectroscopy (EELS) and electron spectroscopic and dark field imaging. The foil finds applications when nano-sized features are to be studied, such as biomacromolecular complexes, are studied in a free hanging layer of sustaining medium.

The carbon film thickness is closely controlled to be within the range of 10-12 nm. Across the film, there is virtually no thickness variation. Note that wherever there is the carbon film, there is the possibility for a thin (less than 20 nm) polymer layer, remaining from the production process. We always try to remove all of it, but sometimes, some thin amount does remain. However, the holes are guaranteed to be "clean", there is no polymer film layer covering any of the holes. So when you take data from a sample that is "over" a hole, you can be sure that there is nothing other than the sample in the path of the electron beam.

All shipments of Quantifoil holey carbon grids are shipped in [SPI Supplies Slide-A-Grids storage boxes](#) with the holey carbon film on the dull side of the grid. The carbon film side always faces the center of the grid box.

Quantifoil films are available in a number of styles and patterns.

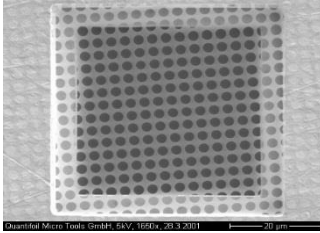
Circular Holes:

Quantifoil with circular holes is preferred for cryo-TEM. The roundness of the holes is advantageous with respect to the formation of an ice layer of constant thickness. The hole size spacing that is selected depends on the magnification being contemplated, and also, whether one wishes to include or exclude evidence of the support film in the final image.

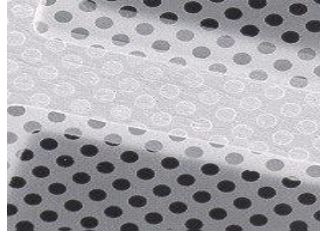
Assessment of the image quality is easier when the foil is included in the final image, since the power spectrum of a foil is stronger than that of unsupported ice.

Quantifoil holey films with 2 and 1.2 μm circular holes are used with magnifications in the range of 30,000X to 40,000X. Quantifoil R 2/4 is probably recommended over R 2/2 when an increased tolerance with respect to position of the beam, and a larger beam diameter is desired, such as in the case of automated image acquisition.

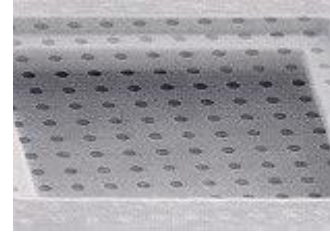
Quantifoil R 2/1



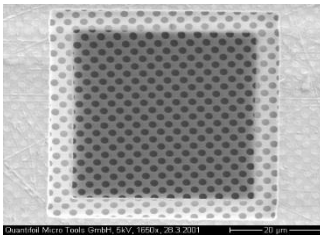
Quantifoil R 2/2



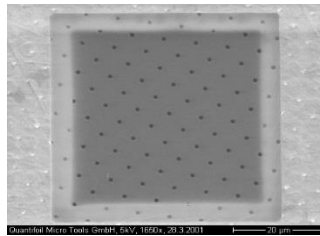
Quantifoil R 2/4



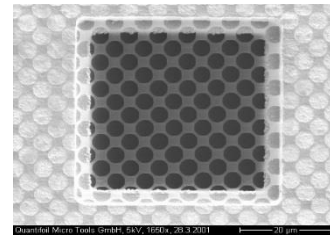
Quantifoil R 1.2/1.3



Quantifoil R 1/4



Quantifoil R 3.5/1



Circular holes (in μm)			
Style	Hole size	Space Btw Holes	Center to Center distance
R 2/1	2	1	3
R 2/1	2	2	4
R 2/4	2	4	6
R 1.2/1.3	1.2	1.3	2.5
R 3.5/1	3.5	1	4.5
R 1/ 4	1	4	5
R5/20	5	20	25
R 0.6/1	0.6 (can be up to 1 μm)	1	1.6

Square Holes:

Quantifoil with square holes, or which is in the form of a square mesh, with relatively thin "bars" can be used in conjunction with TEM work, where the carbon film being used is too thin to span the distance between grid bars or to support sections from which EDS is being done. The square hole film is also useful for particles that are larger than one of the $7 \times 7 \mu\text{m}$ holes. Quantifoil S7/2 represents the optimum geometry when ones requires not only good mechanical stability on the one hand, but also maximum open area.

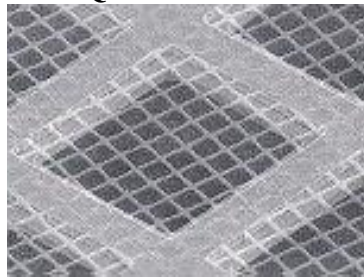
The Quantifoil holey films are available on "standard, stock" grid mesh, namely 200, 300, 400, and 100x400 mesh, in Cu, Ni, Au and Rh plated Cu. Other grid meshes and other grid constructions are possible as a special order.

The square mesh film is also available on the SPI Multi-Slot TEM grid, in both copper and nickel. Often times one does not know which size slot will be the optimum for their work, and this style grid permits the selection of the one that is the best for that particular application.

Special note:

For the SPI Multi-Slot TEM grid only, the Quantifoil S 7/2 pattern is supported with a Formvar® film in order to make the entire sample more stable.

Quantifoil S 7/2

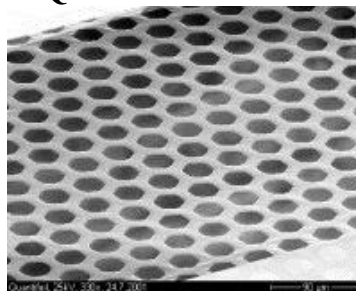


Square Holes (in μm)			
S 7/2	Size: 7	Bar width: 2	Repeat distance 9

Hexagonal Holes:

Quantifoil® Hexagonal Geometry was developed for use with TEM slot grids. It was especially designed for supporting serial thin sections. It offers an optimum between mechanical stability on the one hand and a support-free area on the other hand. The foil is thin enough to allow those parts of the sections that lie on the carbon (not the grid) bars to be visualized and in most respects, still available for viewing and interpretation. The standard product is supplied on 0.5 x 2mm slot grids.

Quantifoil Hex 15



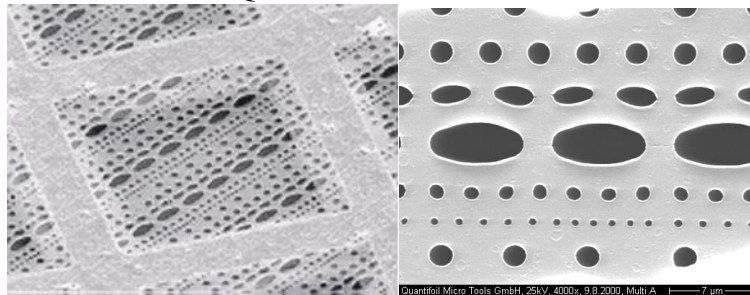
Hexagonal Holes (in μm)			
HEX 15	Size: 26 (inscribed circle)	Bar width: 15	Repeat distance: 41

"Multi A" Holey Films:

Quantifoil Multi A is a holey support film in which a pattern of various hole sizes, shapes and arrangements are repeated. In addition to circular holes, of three different diameters, there are also different hole spacings, including an oval hole which at high tilt angles would appear round (this would occur at $\sim 70^\circ$).

The diameters of the circular holes are (about) 1, 1.4, and 2 μm , and the "bar widths" range from 0.5 to 4 μm . The oval holes in the foil have a dimension of 8x2 μm and 4 x 1 μm . By "bar width" we mean the distance covered, on carbon film, from the edge of one hole to the nearest neighbor hole.

Quantifoil Multi A Foil



Multiple Holes			
Multi A	Circular holes: 1 to 2	Oval Holes: 4x1, 8x2	Bar width: 0.5 to 4

Still undecided on which Quantifoil holey film is best for your application?

Try the Quantifoil "Sampler" kit. It was designed for that very purpose and includes three each of the following grids:

- Quantifoil R 1.2/1.3
- Quantifoil R 2/1
- Quantifoil R 3.5/1
- Quantifoil Multi A

All grids are 300 mesh copper.

Revised: EER
4/16