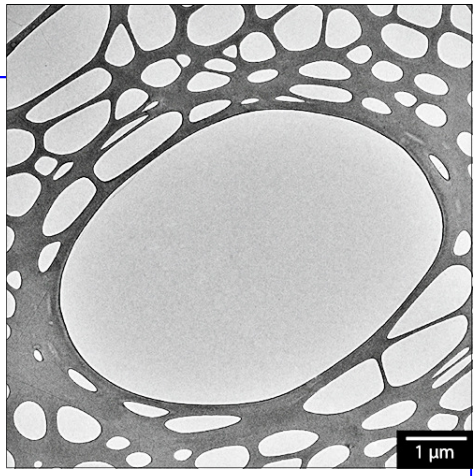
Graphene and Graphene Oxide Coated Grids

There are currently two Graphene substrates available - **CVD Graphene** (chemical vapour deposition) and **Graphene Oxide** (GO). Graphene oxide films are typically laid down on lacey carbon films in suspension form with micrometer sized flakes with a less controlled thickness and evenness of coverage over the grid. CVD Graphene oxide films on the other hand are produced by oxidizing CVD Graphene films at relatively low temperatures in oxygen (typically 200ºC or less). These are continuous films and typically have well characterized hydrophilic properties which is important for wetting the surface of the Graphene oxide film. This property aids in the dispersion of nano particles for example but is also important for cellular biology and protein chemistry applications. ***GO films are considerably less costly than CVD Graphene.***

Graphene Oxide (GO) Support Films



Graphene oxide (GO) provides a support film up to 50% thinner than the equivalent carbon support but has a higher mechanical strength, electrical and thermal conductivity. TAAB Graphene Oxide support films are almost transparent in the electron beam and are available on holey and lacey carbon and Quantifoil® supports. These new GO films are hydrophilic and ideally suited to imaging of small nanoparticles, nanowires and suspensions. Their low atomic number and thin-layer thickness result in significantly lower background contrast than conventional supports. GO support films are also ideal for Cryo TEM studies. The vitreous ice layer can be significantly thinner on GO support films providing higher contrast and hence higher resolution for structural determination.

Graphene offers some unique advantages for studying interactions and processes at the atomic level. As the first readily available two-dimensional material, it is a model system for transmission electron microscopy studies; being almost electron transparent it enables other species to be resolved on its surface with atomic resolution. It is also a well-defined surface, allowing surface science techniques to be integrated with high resolution transmission electron microscopy and scanning probe microscopy.

G203/10 GO film on ***lacey*** *carbon* on 300 mesh Hex Cu grid (10)
G203/50 GO film on ***lacey*** *carbon* on 300 mesh Hex Cu grid (50)

G203/25 GO film on ***lacey*** *carbon* on 300 mesh Hex Cu grid (25)

G217/10 GO film on *holey* carbon on 300 mesh Hex Cu grid (10)
G2127/50 GO film on *holey* carbon on 300 mesh Hex Cu grid (50)

G217/25 GO film on *holey* carbon on 300 mesh Hex Cu grid (25)

G204/10 GO film on Quantifoil R 2/4 on 300 mesh Cu (10)
G204/50 GO film on Quantifoil R 2/4 on 300 mesh Cu (50)

G204/25 GO film on Quantifoil R 2/4 on 300 mesh Cu (25)

G219/10 GO film on Quantifoil R 2/4 on 200 mesh Cu (10)
G219/50 GO film on Quantifoil R 2/4 on 200 mesh Cu (50)

G219/25 GO film on Quantifoil R 2/4 on 200 mesh Cu (25)

G220/10 GO film on Quantifoil R 1.2/1.3 on 400 mesh Cu (10)
G220/50 GO film on Quantifoil R 1.2/1.3 on 400 mesh Cu (50)

G220/25 GO film on Quantifoil R 1.2/1.3 on 400 mesh Cu (25)

Available on other supports to special order

Graphene TEM Support Films

Our Graphene TEM support films are supported by a lacey carbon film on a 300 mesh copper grid. The single, continuous Graphene sheet covers the entire 300 mesh area of the TEM grid. This creates a usable area of around 75% of the TEM grid, leaving plenty of space for specimens or experiments. The Graphene films are available with either 1, 2, 3-5 or 6-8 layers of Graphene. The 2 layer Graphene is ideally suited for high resolution TEM imaging, imaging of nanoparticles and imaging of weak contrast materials. Graphene exhibits excellent conductivity and very high transparency for electrons. The more robust 3-5 and 6-8 layer Graphene are offered for use as an experimental platform for Graphene research. It can be used for nano scale experiments or Graphene applications research with subsequent high resolution imaging.

The Graphene used for these Graphene TEM support films is grown on copper foil using a CVD process. The Graphene is then released by dissolving the copper foil and transferred onto the lacey carbon/300mesh grid by using a proprietary transfer technique.

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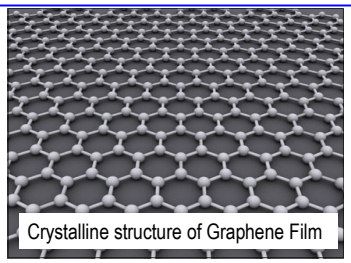
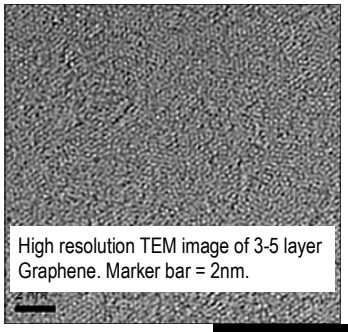
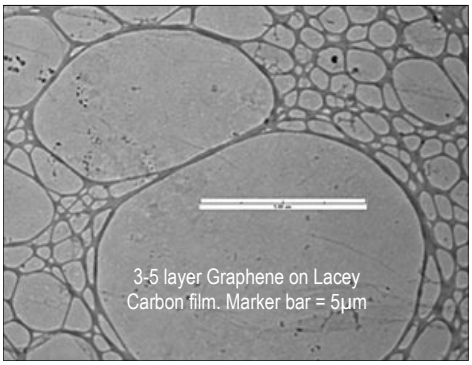

Crystalline structure of Graphene Film


High resolution TEM image of 3-5 layer Graphene. Marker bar = 2nm.

Graphene Films on Grids



Graphene specifications

Thickness for the single layer of Graphene is normally approx. 0.35nm. Transparency of the single layer of Graphene is approx. 96.4%.

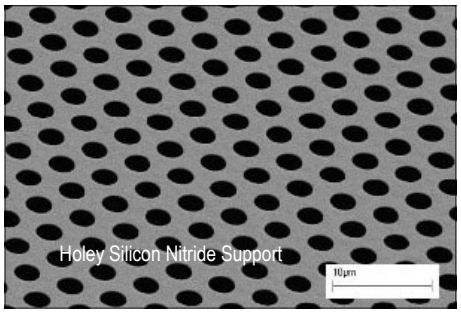
Thickness for the 2 layers of Graphene is normally approx. 0.7nm. Transparency of the 2 layers of Graphene is approx. 92.7%.

Thickness for the 3-5 layers of Graphene is between 1.0 - 1.7nm. Transparency of 3-5 layers of Graphene is in the range of 90.4 - 85.8%.

Thickness for the 6-8 layers of Graphene is between 2.1 - 2.8nm. Transparency of 6-8 layers of Graphene is in the range of 83.2 - 78.5%.

The Graphene has an in-plane modulus of 0.9TPa (compared with 1.0 TPa for Graphene produced by the scotch tape method).

Graphene Films on Holey Silicon Nitride



Graphene Films on Ultra-flat SiO_2 Substrate

Single Layer Graphene Support Films

All films are on lacey carbon 300 mesh copper grids. Available in packs of 5, 10 or 25 in grid box.

G205/5	Single layer Graphene on 300 mesh lacey carbon pack of 5
G20510	Single layer Graphene on 300 mesh lacey carbon pack of 10
G205/25	Single layer Graphene on 300 mesh lacey carbon pack of 25

2 Layer Graphene Support Films

G206/5	Two layer Graphene on 300 mesh lacey carbon pack of 5
G206/10	Two layer Graphene on 300 mesh lacey carbon pack of 10
G206/25	Two layer Graphene on 300 mesh lacey carbon pack of 25

3 to 5 Layer Graphene Support Films

G207/5	3-5 layer Graphene on 300 mesh lacey carbon pack of 5
G207/10	3-5 layer Graphene on 300 mesh lacey carbon pack of 10
G207/25	3-5 layer Graphene on 300 mesh lacey carbon pack of 25

6 to 8 Layer Graphene Support Films

G208/5	6-8 layer Graphene on 300 mesh lacey carbon pack of 5
G208/10	6-8 layer Graphene on 300 mesh lacey carbon pack of 10
G208/25	6-8 layer Graphene on 300 mesh lacey carbon pack of 25

Graphene supported by Holey Silicon Nitride which has 2.5µm holes with a 4.5µm pitch in 200nm Si_3N_4 over a 0.5 x 0.5mm window size. The Graphene sheet covers the complete window with the ultraflat Si_3N_4 holey membrane and leaves free standing Graphene covering the 2.5µm holes. Total usable area is approx. 75% due to unavoidable folds and wrinkles in the Graphene sheet. Available with single, 2, 3-5, and 6-8 layer Graphene sheets. Research-ready product, suitable for UHR imaging or as ultra-flat experimental platform. Graphene specification as for above 300 mesh lacey carbon.

G209/5	Single Layer Graphene on Holey Silicon Nitride as above pack of 5
G209/10	Single Layer Graphene on Holey Silicon Nitride as above pack of 10
G209/25	Single Layer Graphene on Holey Silicon Nitride as above pack of 25
G210/5	2 layer Graphene on Holey Silicon Nitride as above pack of 5
G210/10	2 layer Graphene on Holey Silicon Nitride as above pack of 10
G210/25	2 layer Graphene on Holey Silicon Nitride as above pack of 25
G211/5	3-5 layer Graphene on Holey Silicon Nitride as above pack of 5
G211/10	3-5 layer Graphene on Holey Silicon Nitride as above pack of 10
G211/25	3-5 layer Graphene on Holey Silicon Nitride as above pack of 25
G212/5	6-8 layer Graphene on Holey Silicon Nitride as above pack of 5
G212/10	6-8 layer Graphene on Holey Silicon Nitride as above pack of 10
G212/25	6-8 layer Graphene on Holey Silicon Nitride as above pack of 25

Graphene on Ultra-flat SiO_2 substrate offered for use as a research-ready experimental platform. The Graphene sheet covers the complete 5 x 5mm diced substrate. Total usable area is approx. 75% due to unavoidable folds and wrinkles in the Graphene sheet. Suitable for AFM imaging or as ultra-flat experimental platform. The Specification of the Graphene is the same as mentioned above. Supplied in a Gel-Pak box and packed in class 10 clean room conditions. Consists of a 200nm thermally grown SiO_2 film on an ultra-flat silicon wafer with a normal thickness of 675 µm.

G213/5	Single Layer Graphene on Ultra-flat Thermal SiO2 Substrate, 5x5mm pack of 5
G213/10	Single Layer Graphene on Ultra-flat Thermal SiO2 Substrate, 5x5mm pack of 10
G213/25	Single Layer Graphene on Ultra-flat Thermal SiO2 Substrate, 5x5mm pack of 25
G214/5	2 Layer Graphene on Ultra-flat Thermal SiO_2 Substrate, 5x5mm pack of 5
G214/10	2 Layer Graphene on Ultra-flat Thermal SiO_2 Substrate, 5x5mm pack of 10
G214/25	2 Layer Graphene on Ultra-flat Thermal SiO_2 Substrate, 5x5mm pack of 25
G215/5	3-5 Layer Graphene on Ultra-flat Thermal SiO_2 Substrate 5x5mm pack of 5
G215/10	3-5 Layer Graphene on Ultra-flat Thermal SiO_2 Substrate 5x5mm pack of 10
G215/25	3-5 Layer Graphene on Ultra-flat Thermal SiO2 Substrate 5x5mm pack of 25
G216/5	6-8 Layer Graphene on Ultra-flat Thermal SiO_2 Substrate 5x5mm pack of 5
G216/10	6-8 Layer Graphene on Ultra-flat Thermal SiO_2 Substrate 5x5mm pack of 10
G216/25	6-8 Layer Graphene on Ultra-flat Thermal SiO_2 Substrate 5x5mm pack of 25

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