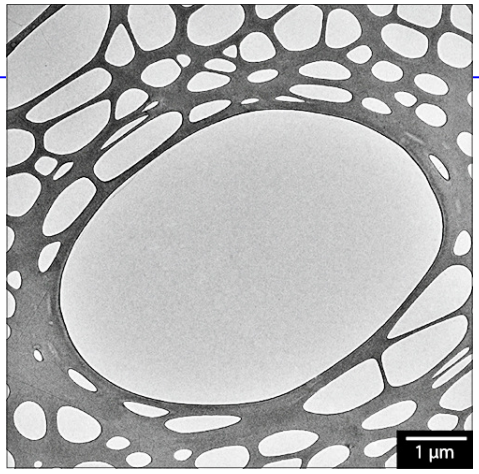
Graphene and Graphene Oxide Coated Grids

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 square Cu grid (10) **G203/25** GO film on ***lacey*** *carbon* on 300 mesh square Cu grid (25)
G203/50 GO film on ***lacey*** *carbon* on 300 mesh square Cu grid (50)

G217/10 GO film on *holey* carbon on 300 mesh square Cu grid (10) **G217/25** GO film on *holey* carbon on 300 square Cu grid (25)
G217/50 GO film on *holey* carbon on 300 mesh square Cu grid (50)

G204/10 GO film on Quantifoil R 2/4 on 300 mesh Cu (10) **G204/25** GO film on Quantifoil R 2/4 on 300 mesh Cu (25)
G204/50 GO film on Quantifoil R 2/4 on 300 mesh Cu (50)

G219/10 GO film on Quantifoil R 2/4 on 200 mesh Cu (10) **G219/25** GO film on Quantifoil R 2/4 on 200 mesh Cu (25)
G219/50 GO film on Quantifoil R 2/4 on 200 mesh Cu (50)

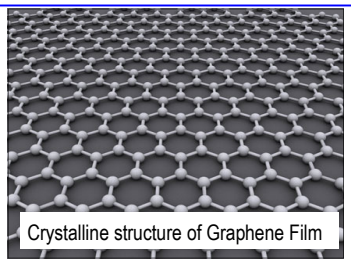
G220/10 GO film on Quantifoil R 1.2/1.3 on 400 mesh Cu (10) **G220/25** GO film on Quantifoil R 1.2/1.3 on 400 mesh Cu (25)
G220/50 GO film on Quantifoil R 1.2/1.3 on 400 mesh Cu (50)

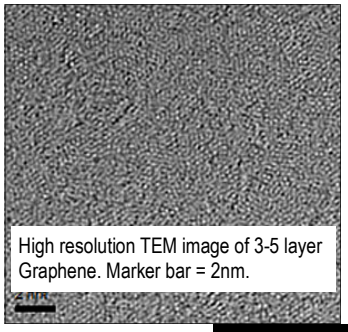
Available on other supports to special order

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.


Crystalline structure of Graphene Film


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

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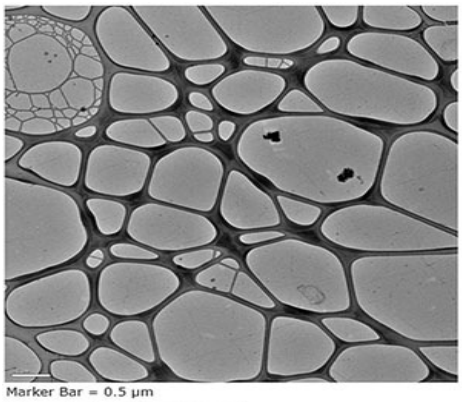
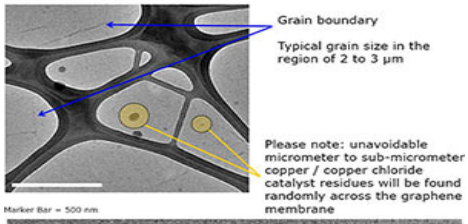
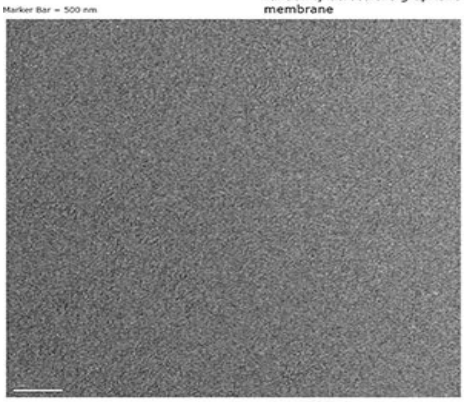
Graphene Films on Grids

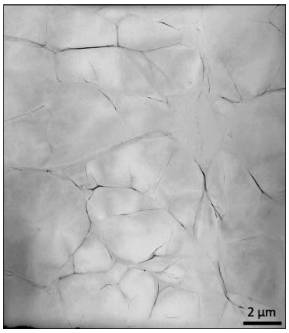


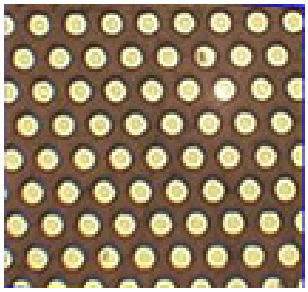
Marker Bar = 0.5 µm





5 nm Marker Bar HR-TEM image





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).

Films on lacey carbon 300 mesh copper grids. Available in packs of 5 or10 in grid box.

Single Layer Graphene Support Films

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

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

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

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

2-3 layer Graphene coating on 1000 or 2000 mesh Cu grid

Unsupported graphene film with almost 100% coverage is stable, clean and provides a large viewing area. May be used in biological and materials science where films are used to characterise the structure of nanoparticles and thin film growth.

G351 Graphene coating on 2000 mesh Cu grid pack of 10
G350 Graphene coating on 1000 mesh Cu grid pack of 10

Films on 2000 mesh supports These are a 2000 mesh Cu grids supported by a 2 x 1mm slotted Cu grid. This combination delivers a rigid base but with a total thickness less than 50µm. The usable area is a slot 2 x 1mm with a transmission of 41%. The holes in the 2000 mesh Cu grids are circular with a diameter of 6.5µm leaving unsupported graphene over these circular openings.

Single Layer Graphene TEM Support Films

G346/5 Single layer graphene on 200 mesh copper grid pack of 5
G346/10 Single layer graphene on 200 mesh copper grid pack of 10

2 Layer Graphene TEM Support Films

G347/5 2 layer graphene on 200 mesh copper grid pack of 5
G347/10 2 layer graphene on 200 mesh copper grid pack of 10

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