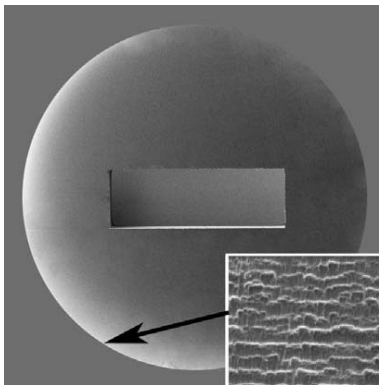
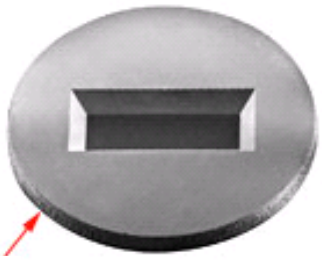
Silicon Nitride Thin Film Windows for Microscopy

TAAB introduces a new generation of Silicon Nitride Support Films for EM imaging and analysis. These resilient, ultra-smooth low stress inorganic silicon nitride support films have been developed as an addition to our available range of TEM support films to enable specific nanotechnology and molecular biology research. They represent the next level in silicon nitride support films and offer remarkable advantages over the silicon nitride support films currently offered. The largest window size is 0.5 x 1mm combined with a 50nm thin support film and EasyGrip™ edge.



Silicon nitride support films have the great advantages of being chemically and mechanically robust and are able to withstand temperature changes up to 1000°C. They are extremely stable and suitable to conduct a variety of nanotechnology experiments with particles or cells mounted directly on the support films. Greatly improved handling capabilities and smoothness of the EasyGrip™ edges are design offer advantages over other brands of silicon nitride support films.

Our Silicon Nitride Support Films are manufactured with a 3mm diameter structure compatible with TEM grids and are completely free from debris particles. The purpose designed packaging keeps the support films free from artefacts and contamination. The mechanical and chemical stability allow for cleaning of the silicon nitride support films with chemicals (solvents, acids and bases), glow discharge and plasma cleaning.



EasyGrip™ Edge

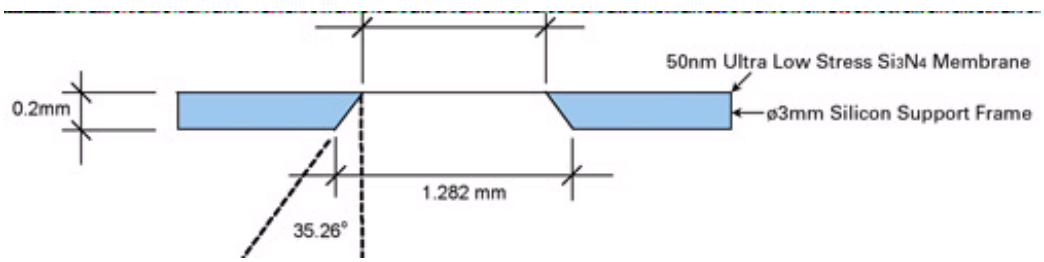
Examples of Application Fields

The Silicon Nitride Support Films are indispensable tools for virtually all fields of nanotechnology research. They enable direct deposition and in-situ observations of dynamic reactions over a wide temperature range. Applications fields include, but are not limited to:

- **Cell biology:** attached cells can be grown in their environment on the support film and subsequently analysed
- **Analysis of colloids, aerosols, nanoparticles**
- **Self-assembled mono-layers**
- **Polymer research**
- **Thin film research (directly deposited on the silicon nitride support film)**
- **Materials science**
- **Properties of nano-structures for semiconductor devices**

These superior Silicon nitride support films are made by state-of-the-art semiconductor and MEMS fabrication techniques using resilient, low-stress inorganic silicon nitride thin films supported by a sturdy silicon frame. The thin silicon nitride film is grown on a 200µm thick silicon wafer to the desired membrane thickness of 50nm. The specimen viewing area is created by etching away a window in the silicon wafer substrate underneath the Si_3N_4 membrane, leaving a perfectly smooth, resilient and chemically robust silicon nitride film. The membrane is not supported in the window area, enabling large viewing areas without any disturbing bars. A new addition is Hydrophobic and Hydrophilic Substrates for Nanotechnology and Biotechnology applications. The 50nm membranes have been Atomic Layer-Deposited (ALD) modified to created these surfaces.

Window sizes and shape Three window sizes are available with a 50nm thin support on 3mm Ø frame :
0.5 x 05mm sturdy and most cost effective
1 x 1 mm larger area, but more fragile
1.5 x 0.5mm , sturdy for large viewing area or tomography
Due to the structure of the silicon and the etching process the window in the silicon substrate is etched with a 35° angle, leaving a much larger opening than the membrane window at the back side of the frame.



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Silicon Nitride Windows Continued...

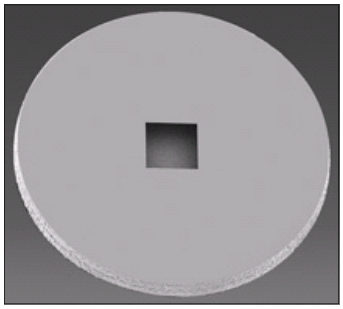
Frame dimensions
The frame is manufactured as a 3mm silicon disc with smooth EasyGrip™ edges for easy manipulation by tweezers and will fit perfectly in standard TEM holders. Handling capabilities and smoothness of the edges are design advantages over other brands of silicon nitride support films. These Silicon Nitride Support Films are manufactured like grids with a 3mm diameter, have no broken edges and are completely free from debris particles. The mechanical and chemical stability allow for cleaning of the silicon nitride support films with chemicals (solvents, acids and bases), glow discharge and plasma cleaning. It is recommended that ultrasonic cleaning not be used, as it can easily shatter the silicon nitride support films.

Effects on tilt
Due to the 35° etching angle the Si_3N_4 support films on the frames can be tilted to 35° for unobstructed viewing, even if the specimen is close to the edge of the membrane. For higher tilting angles, the specimen needs to be in the centre of the membrane. To allow for the highest possible tilt angle a window size of 1.5 x 0.5mm has been made available which allows for tilting angles up to 70° with a viewable area of 40%. Maximum tilt angle with a specimen in the centre is 75°.

Frame thickness: silicon support is 200µm standard. This allows for a fit in all standard TEM holders and gives a sturdy support frame
Surface Roughness: The RMS (Rq) is 0.65 +/- 0.06nm which gives a mean roughness (Ra) of 0.45 +/- 0.02nm.
Frame diameter: EM standard 3mm diameter disc, fully compatible with TEM holders and with EasyGrip™ sides for handling
Packaging: The Silicon Nitride Support Films are packaged under cleanroom conditions in a TEM Grid Storage Box. Each box holds 10 support films.

SXXX Silicon Nitride Window , 50nm thick, 0.5mm square window pack 10
SXXX Silicon Nitride Window, 50nm thick, 0.5mm square pack 100
SXXX Silicon Nitride Window, 50nm thick, 1.0mm square pack 10
SXXX Silicon Nitride Window, 50nm thick, 1.0mm square pack 100
SXXX Silicon Nitride Window, 50nm thick, 0.5 x 1.5mm pack of 10
SXXX Silicon Nitride Window, 50nm thick, 0.5 x 1.5mm pack of 100

Hydrophobic and Hydrophilic Silicon Nitride Membrane Surfaces



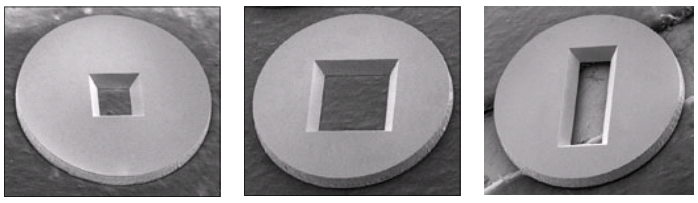
50nm Silicon Nitride membranes have been Atomic Layer-Deposited (ALD) modified to change their properties. Depending on the process used both Hydrophobic and Hydrophilic substrates have been created with the following advantages:

- Choice between low and high surface energies
- Smooth and conformal substrates
- Enhanced wetting and biocompatibility (hydrophilic)
- Removes need for plasma treatment of surface prior to cell growth
- Hydrophobic coating offers novel platform for deposition and growth of nanomaterials

Available on 50nm silicon nitride membrane with a window size of 0.5 x 0.5mm on a 200um silicon frame with a diameter of 3mm. Compatible with all standard TEM grid holders.

SXXX *Hydrophilic* 50nm Silicon Nitride Membrane 0.5 x 0.5mm window pack of 10

Silicon Nitride Aperture Discs - No Film

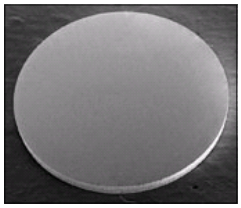


These Silicon Nitride Aperture Discs are 3mm disc type frames with a thickness of 200µm and square or rectangular apertures. They have found a variety of applications:

Support frame to attach TEM lamellas made with FIB
Support frame for thin films, foils, wires and fibres
Mask for thin film research (deposition mask)

SXXXSilicon nitride aperture disc 0.5 x 0.5mm pck 10
SXXXSilicon nitride aperture disc 1.0 x 1.0mm pck 10
SXXXSilicon nitride aperture disc 1.5 x 0.5mm pck 10

Silicon Nitride 3mm Blank Discs



These 3mm silicon discs have a 50nm ultra low stress silicon nitride layer (Si_3N_4) on both sides and can be used for a number of applications:
Specimen mounts for SEM and FESEM applications
Specimen disks for AFM applications which need a Si_3N_4 background

SXXX Silicon nitride 3mm blank discs pack of 10