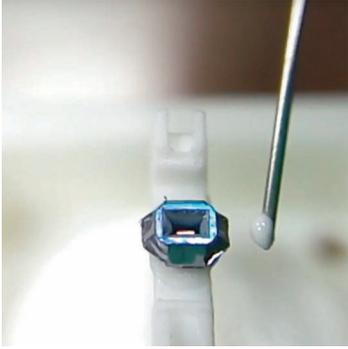


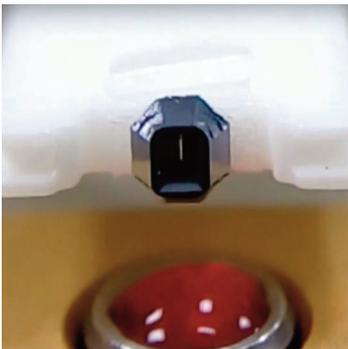
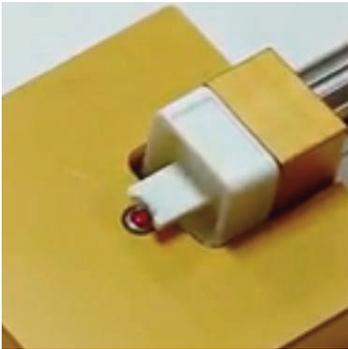


an innovative enclosed specimen holder
for Liquid TEM

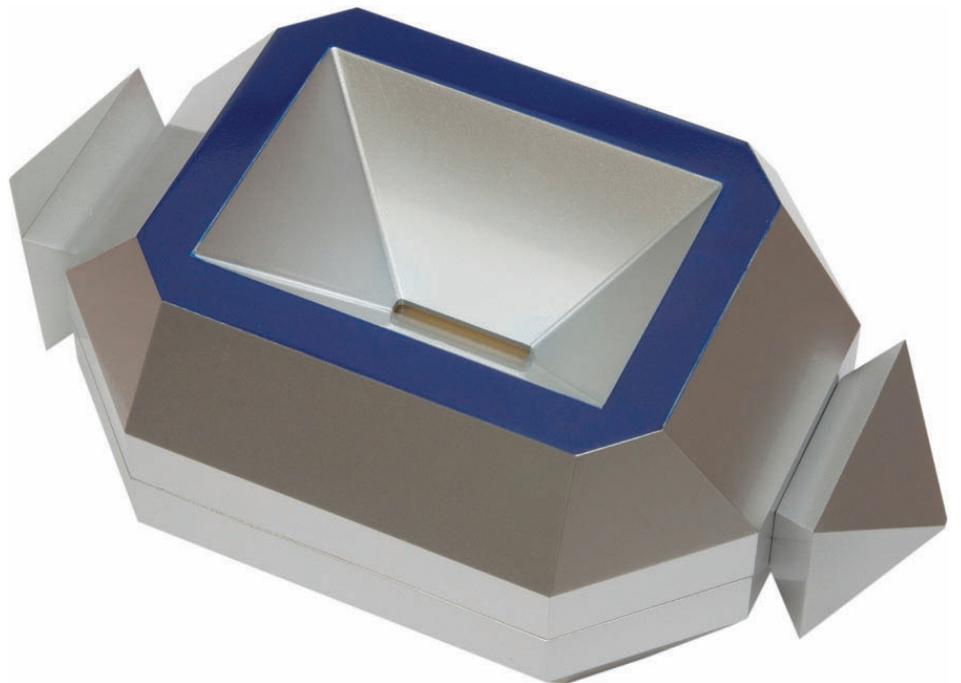


Wet “Liquid” TEM Kit

K-kit – Silicon-based Micro Channel Device



**Electron
Microscopy
Sciences**



Wet "Liquid" TEM Kit

K-kit – Silicon-based Micro Channel Device

USER GUIDE:

1. K-kit

Observation Window

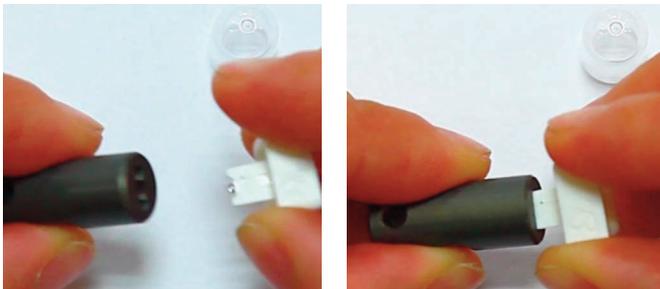


Channel Openings



Liquid Channel Direction

K-kits are Si-based microchannel devices with silicon nitride windows that allow TEM observation. The seemingly irregular shape is a result of KOH anisotropic wet etching, which is also responsible for forming the rectangular observation window in the middle of the device. The liquid channel is parallel to the window, with openings at both ends.

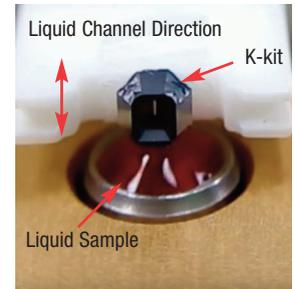
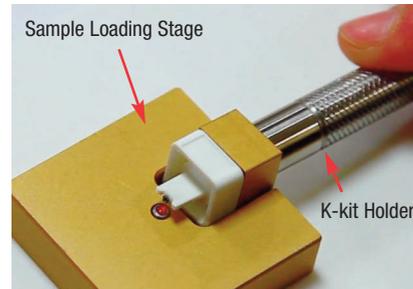


There are channel tips at each end of the channel to protect the surface condition until before use. Use the channel opener to open the channel by inserting the K-kit carrier top into the opener. Gently push in to the end. The channel opener has a self-guiding slot and a mechanism to break off the tips before the carrier top plate reaches the end.

2. Liquid Loading

Place about 2 micro-liter liquid sample at the center of Sample Loading Stage. Place the K-kit carrier at the end of the K-kit holder.

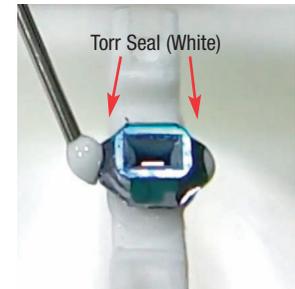
Fit the notch of the holder onto the horizontal rod on the Loading Stage, forming a lever hinged on the rod. This will place the K-kit on the carrier right above the liquid drop. Lower the K-kit to make contact with liquid by gently lifting the back of the K-kit Holder.



Liquid fills the channel through capillary force. The liquid surface is "pulled up" by the K-kit. Keep the K-kit steady for approximately 1 min to allow for the filling to complete. The aqueous liquid sample should be placed on a glass slide. Both the K-kit and glass surface are hygroscopic. Do not immerse the K-kit in liquid.

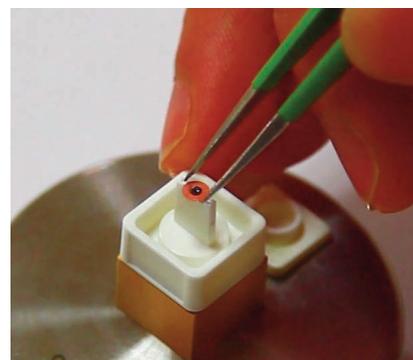
3. Vacuum Seal

Place the K-kit carrier on the Gluing Stand. Use Needle Pen to pick and apply the seal epoxy on to the channel openings. Cover the channel openings at both ends



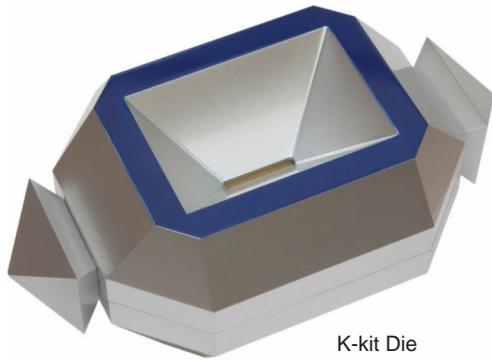
with adequate amount of seal epoxy.

To ensure the liquid can be well reserved in K-kit, it's strongly recommended to complete the channel-sealed gluing within 1 min after liquid loading.

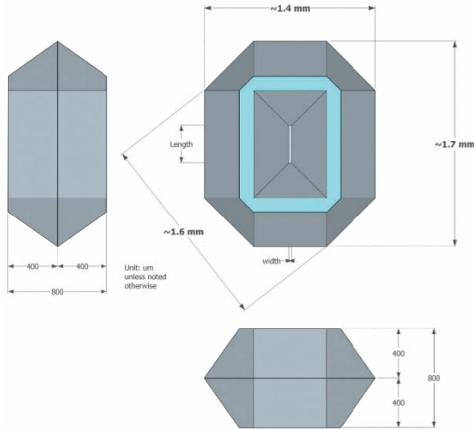


4. Copper Grid

Keep the K-kit carrier on the Gluing Stand. Use Needle Pen to pick and apply the Mounting Glue epoxy on to K-kit peripheral. Then, place the supplied copper grid over the K-kit. The steps on carrier top plate facilitate centering and leveling the copper grid.



K-kit Die



Wet “Liquid” TEM Kit

Overview

K-kits are sample holders designed to facilitate convenient TEM observation of liquid samples, allowing nanoobjects, aggregates, and agglomerates (NOAAs) in liquid samples to be characterized.

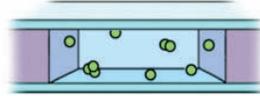
With vacuum compatible sealing of liquids in electron-transmitting thickness, K-kits are micro reaction chambers for countless experiments in materials, chemical, and biological research.

Features

- Applicable for most TEM holder brands
- Strong structural reliability under vacuum
- Sealing glue compatible to many solvents

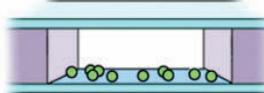
Applications

Wet

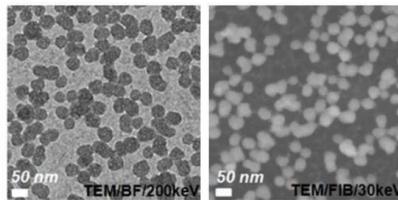


The loaded liquid sample is sealed and imaged using TEM in the native liquid environment.

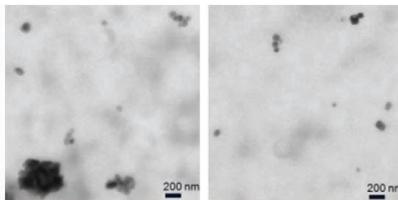
Thin Layer



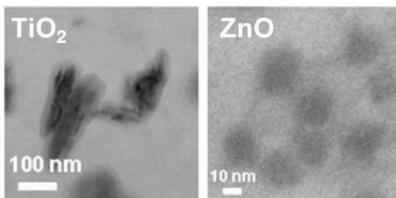
A patented liquid drying protocol preserves the original morphology and physical state of nanomaterials with improved imaging resolution.



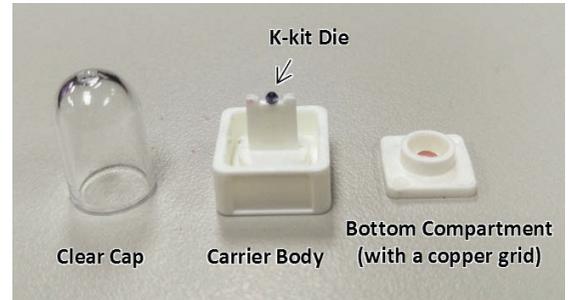
SiO₂ Nanoparticles in Polishing Slurry



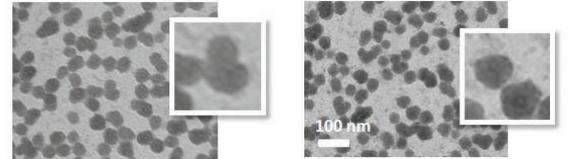
CaCO₂ Nanoparticle Additives in Milk



TiO₂ and ZnO Nanoparticles in Sunscreen Lotion



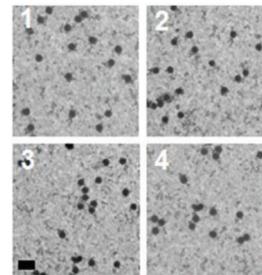
Clear Cap K-kit Die Carrier Body Bottom Compartment (with a copper grid)



TEM images shown: Undiluted Chemical-Mechanical Polishing (CMP) slurry directly loaded into K-kit.

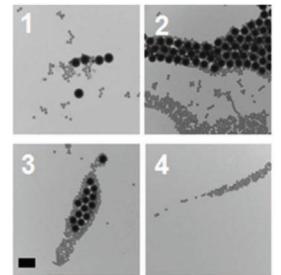
K-kit

original physical state



Conventional

aggregated after drying



Images shown: NIST traceable polystyrene beads. Scale Bar 500nm.

Physicochemical Parameters

	K-kit	Conventional
Composition	✓	✓
Size	✓	✓
Shape	✓	✓
Size Distribution	✓	Δ
Aggregation and Agglomeration in liquid	✓	X
Particle Concentration	✓	X
Liquid TEM Observation	✓	X

✓ = Good Δ = Case dependent X = Not Available

The table below shows the test results of K-kit sealing epoxy soaked in chemical solvents for 24 hours and then examined using FTIR, Fourier Transform Infrared Spectroscopy, (if dissolved) and visual observation (if dispersed).

	Acetone	DCM	DMSO	95% Ethanol	0.1 N HCl	0.1 N KOH
Dissolution (FTIR)	X	X	✓	✓	✓	✓
Dispersion (visual)	X	X	X	✓	✓	✓
	Hexane	IPA	Methanol	PEG400	THF	Di-H ₂ O
Dissolution (FTIR)	✓	✓	✓	✓	X	✓
Dispersion (visual)	✓	✓	X	✓	X	✓

✓ = Not detected (OK) X = Detected (use with care)

Components

- Tools are optional available in a Tool Set or ordered individually. The glues are also available.
- Figures are for illustration purposes. The tools you order may be different in color and/or from minor design changes.



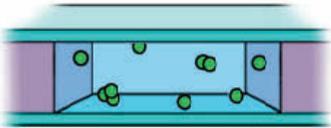
Gluing Stand



Sample-Loading Stage

K-kits

Two gap heights (H) available: 0.2µm or 2µm. Two package options: 4 or 6 K-kits per pack. Additional gap heights and pack sizes available upon request.



Height

K-kit Tool Box



The K-kit Tool box is available in red or silver. It houses a full tool set, including K-kit holder, Sample Loading Stage, Needle Pen, Gluing Stand, Channel Opener, Sealing Glue, Mounting Glue, Glass Slides, 6/pk of K-kits, Shipping Box (empty), and some replacement parts.

K-kit Holder

The K-kit Holder consists of an anodized aluminum header and a stainless steel handle. The K-kit carrier fits on the header (after removing the bottom compartment). When the notch on the side of the header fits over the horizontal bar on the Loading Stage (see below), the K-kit on the carrier attached on the header will be just above the liquid sample.

Sample-Loading Stage

The Loading Stage consists of an anodized aluminum body. It has a horizontal bar in a recess on the side and a hole in the middle to house the Liquid Stage, which is a removable stainless steel rod. The removable design is for easy cleaning. The horizontal bar defines the rotational axis for the K-kit Holder, which has a notch on the header to fit on the horizontal bar.

Needle Pen

The Needle Pen is designed to facilitate the K-kit gluing operation. It has a thin needle 3.0 mm long and 0.27 mm in diameter. The thin needle makes it convenient to pick just enough glue (of the order of 0.1µl(x)) for sealing the channel openings and (around 1µl(x)) for mounting the copper grid. The needle is made of stainless steel. It is strong, yet slightly flexible, suitable for the job.

Notes:

It is important to keep the needle free of residue glue. Please wipe the needle clean right after each use. It will be practically impossible to clean the needle once residue glue on it cures.

The needle is held in place in the pen by a set screw on the side of the pen. A replacement needle and a small Allen key are provided with each Needle Pen. The needle is sharp. Please handle with care.



Channel Opener



Copper Grid



K-kit Holder



Needle Pen

Gluing Stand

The Gluing Stand has a stainless steel base and an anodized aluminum header, which is much like the header on the K-kit holder, without the notch on the side. The Gluing Stand keeps the K-kit carrier in place for gluing work.

Accessory Box

The Accessory Box contains sealing and mounting glues, four plastic sticks, and spare parts, including a spare needle, an Allen key for the Needle Pen, a Channel Opener, and two Liquid Stages. (The label can be redesigned.)



Starter Box

The Starter Box contains all of the essentials for K-kit loading. It consists of glues, a beaker, four stirring sticks, and two stainless steel thin needles.



Channel Opener

The Channel Opener is used to remove the channel tips, while the K-kit stays on the carrier. It's made of anodized aluminum with a cut-off slot design at one end.

Copper Grid

Ten pieces of Copper Grid per pack.



Slide-Glass Pack

Six glass slides per pack.

Ordering Information

Cat. No.	Description	Qty.
K7260-402	K-kit 0.2	4/pk
K7260-420	K-kit 2.0	4/pk
K7260-602	K-kit 0.2	6/pk
K7260-620	K-kit 2.0	6/pk
K7261-R	K-kit Tool Box, Red, includes full tool set	each
K7261-S	K-kit Tool Box, Silver, includes full tool set	each

Accessories

K7263	K-kit Holder	each
K7264	Sample Loading Stage	each
K7265	Needle Pen	each
K7266	Gluing Stand	each
K7267	Accessory Box	each
K7268	Starter Box	each
K7269	Channel Opener	each
K7270	Copper Grid	10/pk
K7271	Slide-Glass Pack	6/pk