NARISHIGE WEB NEWS

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Micromanipulation for Industrial Application -1

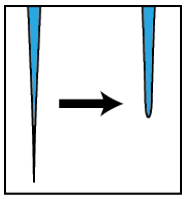
Narishige products are generally recognized as laboratory equipment. Biology study, which includes electrophysiology and microinjection techniques are the major fields where Narishige products are used. Narishige products are varied – micromanipulators that provide fine movement, microinjectors that control tiny amounts of fluid, micropipette pullers that make glass microneedles, microforges and microgrinders that process microneedles – they all can be used for industrial applications. This issue of Narishige Web News discusses examples of industrial applications for which Narishige products can be used

Pick-up Sample for TEM and SEM Observation

A thin-film sample, as thin as 0.1 um or thinner prepared by FIB, is practically impossible to pick up without the aid of an appropriate instrument. In such a case, the sample can be picked up by a glass probe with the aid of electrostatic force.

Production of Glass Probe

A glass probe is not necessarily a glass tube. Narishige G-1000 Glass Rods are useful. The PC-10 Micropipette Puller is used to pull a glass rod into a glass needle. The glass needle that was pulled by the PC-10 Puller has a sharp tip. The tip is polished with the MF-900 Microforge into a round tip. This also increases surface area of the tip. Glass generates electrostatic force. Therefore, a glass tool can be used as a probe for picking up a sample.



Pick-up a film with a micromanipulator

Precise movement is required to pick up the thinned sample. A three-axis coarse manipulator and a three-axis oil-hydraulic micromanipulator (ex. MMO-203) are used in combination. Separate linear movement in X and Y axis is more convenient than movement by joystick. A joystick micromanipulator is not used commonly.

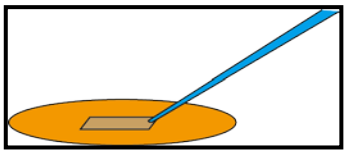
The glass probe is put on a pipette holder and brought to the optical axis of the microscope. Since the sample is not a transmissive sample, an epi-illumination type upright microscope is used. The microscope should be equipped with a long working objective lens to secure space for manipulating the probe.

The FIB processed sample is laid in the center of the optical axis. The focus is adjusted to bring the glass probe into focus. When the glass probe is lowered, the focus level should be lowered first and then the probe is brought into focus. Repeat this process and the glass probe is brought onto the sample. Lowering the glass probe before lowering focus level creates the risk of the glass probe hitting against the sample. Finally, when the sample is in focus, the glass probe is positioned slightly higher than the focus level. Now it is ready for the next step.

Magnification is changed to x500 and the glass probe is brought into the processed area of the sample. The manipulators X-axis is driven slowly to contact the glass probe tip to the processed area. The manipulators Z-axis is driven to raise the glass probe, making sure that the sample is successfully attached to the probe tip. Then, the probe is raised carefully with the film attached.

Transfer film to a mesh

The FIB processed sample is moved from the microscope stage and a mesh is placed so that it is positioned in the center of the optical axis. This is carefully done while being well aware of the glass probe holding the film. While viewing the area of interest, focus is brought to the probe. Again, with the focus level lowered first, the probe is lowered onto the mesh. With the aid of the adherence property of the mesh, the film is caught on the mesh.
The sample is then covered and a TEM/SEM sample is completed.



This kind of ultra sensitive job cannot be done without the aid of an instrument. A micromanipulator can help accomplish this.

Narishige products can be used for the other purposes also, such as holding a terminal of an electric device and dropping fluid to an area of interest. The next Web News will discuss additional uses.

If you have any questions or need further information, please contact us.