Thank you for purchasing OLYMPUS Microcantilever. Please read this manual carefully before use.

**Warning**
- Use protective eye glasses when handling to avoid damage to the eyes from breakage of the cantilever chips.

**Caution**
- Please handle our cantilevers carefully because they are fragile.
- Do not drop or shake the cantilever case. Even when the cantilever chips are contained in the cantilever case, the cantilevers may break if the case is handled roughly or jarred.
- It is recommended that precautions be taken to prevent damage to the cantilever tips from electrostatic discharge.
- Be sure to store the cantilevers at room temperature and moderate humidity.
- When discarding, please obey the laws and regulations in your country and/or your company. These cantilevers are made of silicon, platinum, titanium and aluminum.
Preparation

1) Please prepare the followings before using OLYMPUS cantilevers.
2) To gain a better understanding of how cantilevers and chips are connected, cantilevers should be inspected under the microscope.

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Open the case

1) It is recommended that the cantilever case be opened in a clean environment like a clean bench in order to avoid the cantilever being contaminated. Handling under an ionizer is recommended.
2) Avoid wearing clothes like woolen sweaters, fleece etc that give off the static electricity when handling the cantilever cases and chips. Use of an anti-electrostatic discharge mat and a wrist band is preferable.
3) In opening the case, put the plastic case label-side down on a desk. The cantilevers are tip-side-up as viewed in the case.
4) Open the case.

Picking up the cantilever chip from the case

1) Pick up the chip by the long side with the tweezers and mount it in the AFM.

| Tip View | The tip is fabricated on the very end of the cantilever. Since the tip isn’t hidden by the body of cantilever, it can be positioned exactly at a point of interest using optical microscopy.
| Aluminum reflex coating | Aluminum showing high reflection is employed as the reflex-coat material. Good S/N ratio can be expected in optical deflection sensing.
| Easy chip separation | Every chip substrate is supported to the wafer with support arms and is easily separated from the wafer with tweezers. 375 chips are contained in a wafer.

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As can be seen in the left illustration, a tetrahedral tip is located at the exact end of the cantilever. The finite tip shape will determine the scan line profile as in the illustrations below. The tip profile is symmetric with a half tip angle of 18 degrees macroscopically (see left below). The side tip profile is asymmetric with a tip angle of 35 degrees. Then the cantilever chip is attached to a chip holder in your AFM with an angle, about 10 degrees, the asymmetry is improved (see right below).

The apex of the tetrahedral tip becomes sharper due to an oxide sharpening process. The tip angle around a few hundreds nano meter down from the top, is about 15 to 25 degrees (see below).

As can be seen in the left illustration, the platinum layer is deposited on the basic silicon probe with the titanium interfacial layer. The platinum layer around the probe apex is thinner than that on the cantilever portion. In the spec sheet, the typical value on the flat part as the cantilever portion is described.

In attaching the chip to your SPM instrument, electrically connect to the chip in the cantilever side for stable measurements (see illustration below). It is not expected that the aluminum layer shows enough conductivity because the surface of the aluminum layer is covered with oxide layer.
Problem 1: In adjusting the sensor optics before scanning, the movement of the reflection spot on the photo detector is critical so that the sensor optics is hard to adjust to zero position. When the sensor illumination spot on the cantilever is not small enough and is positioned at the triangular part of the cantilever, unexpected reflection and light scattering occur. This may cause the unexpected movement of the reflection spot on the photo detector.

Solution:
Try to adjust the focus of the sensor optics again and move the spot position a little opposite to the free end of the cantilever.

Problem 2: The electric images turn to vague and low in contrast after several scans in EFM. Even in AC mode operations as EFM, the probe touches the sample surface and the platinum coating may wear.

Solution:
Once platinum layer has worn extremely, the cantilever should be replaced. Since this case is found frequently, look the servo condition of your SPM again.

Problem 3: The electric images of an IC device turn to high contrast after the several scans in SCM. The worn of the platinum coating is suspected. In SCM of IC devices, the signal is depending on the density of the dopant. Blunt probe may interact with more dopants and get higher electric signals.

Solution:
In the case that the platinum layer has worn extremely, even if higher signal is obtained, it is recommended that the cantilever is replaced. Please check the lateral resolution of the image as well as the signal contrast. Those are trade-off.
Please contact following if you have any question on this user's manual.

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Please access to the web page of OLYMPUS micro cantilevers.

http://www.olympus.co.jp/probe