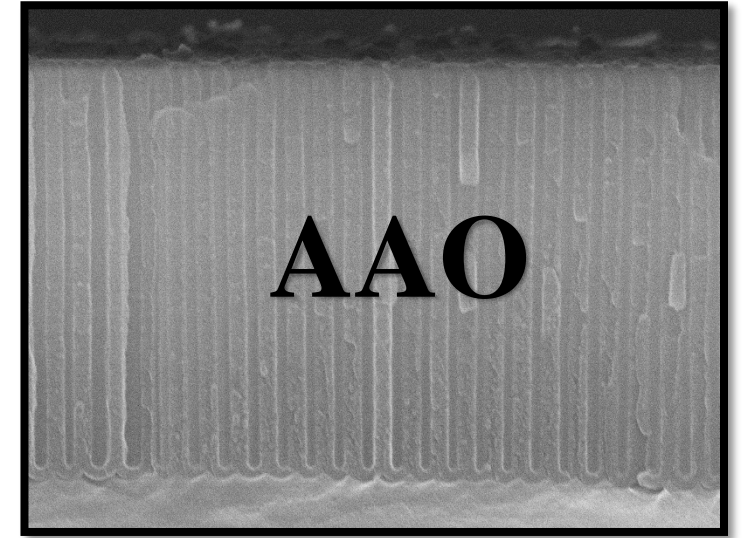
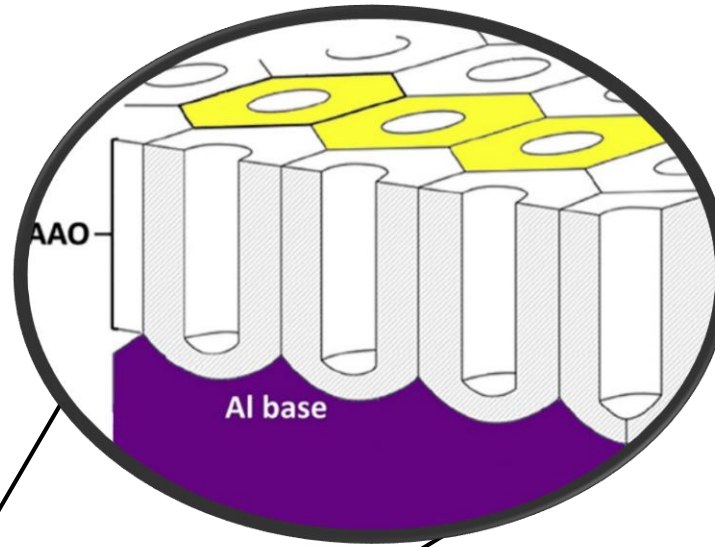
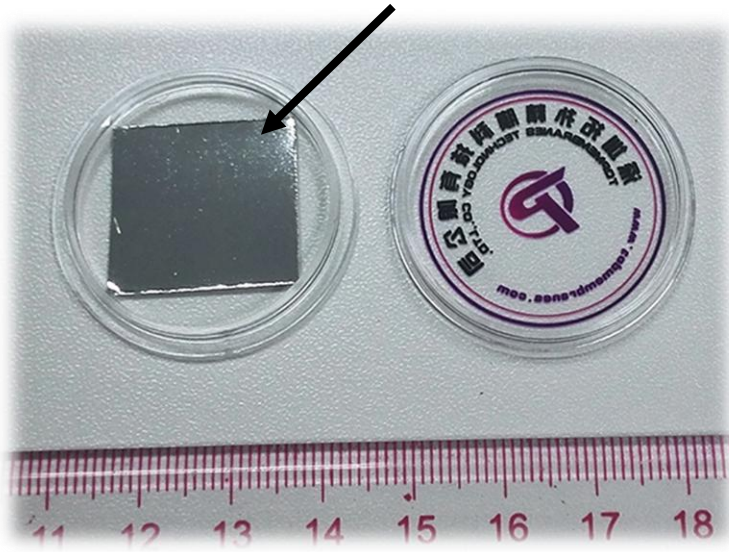
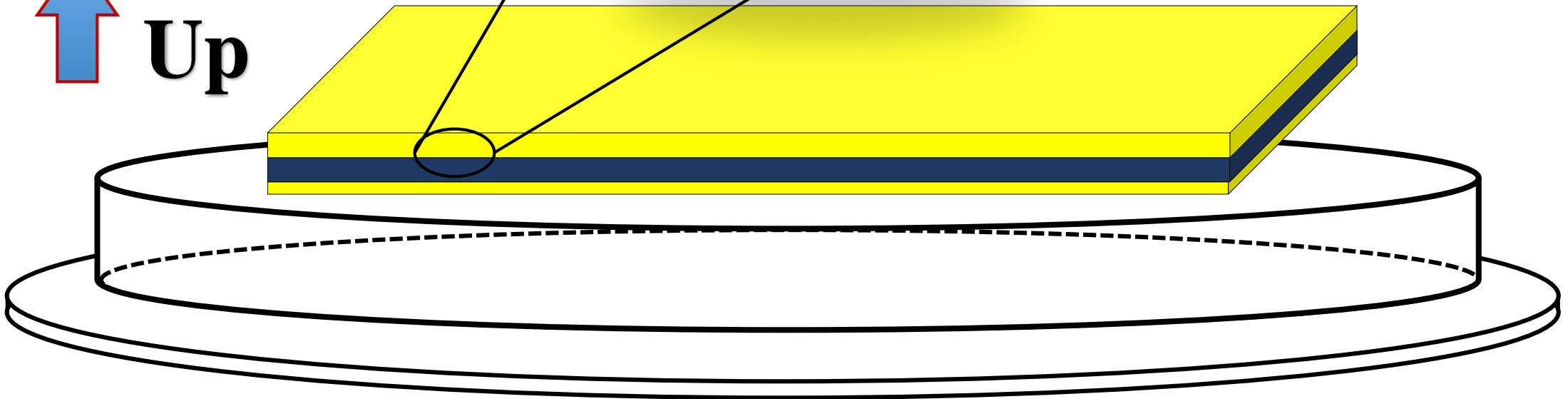


AAO on Al substrate



Up



AAO on Al substrate

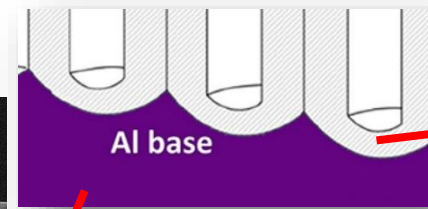
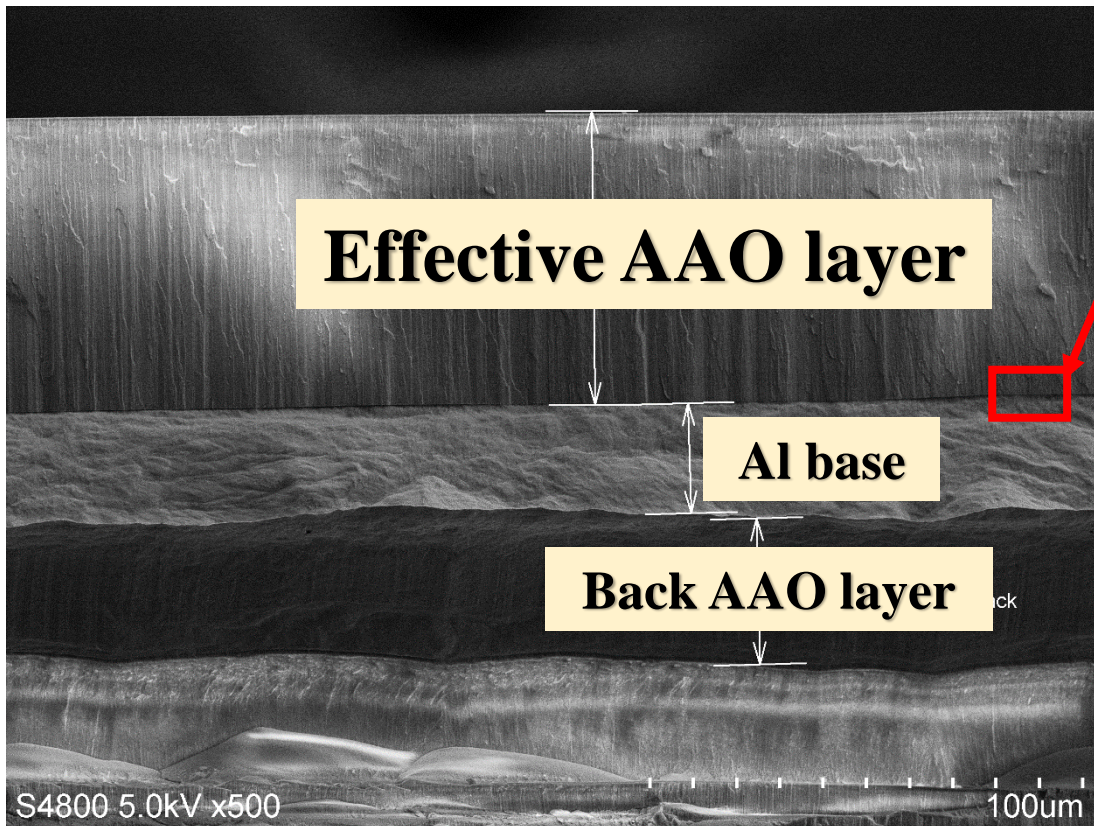
Effective AAO layer

Al base

Back AAO layer



Up



Barrier layer

- ◆ **AAO layer**: the upside AAO layer is effective;
- ◆ **Barrier layer**: the thin barrier layer is at the bottom of the AAO layer;
- ◆ **Al base**: Al layer is between the two AAO layers;
- ◆ **Back AAO layer**: The quality of back AAO layer is not well controlled.

How to remove the AAO template

If the surface of AAO is covered by a layer of other material such as polymer, the template can be removed from backside, as shown in the next page.

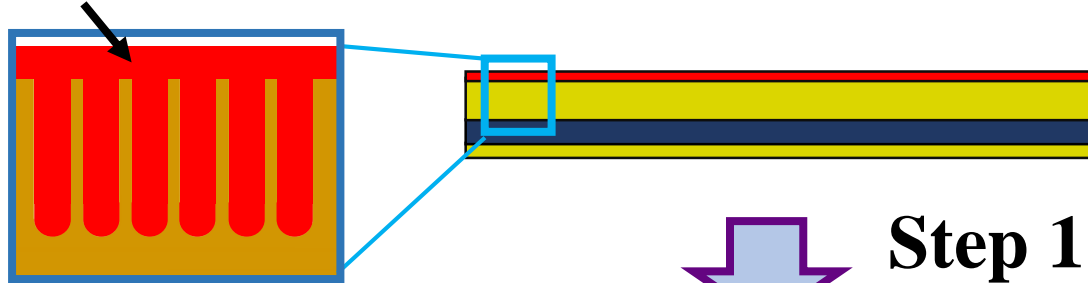
AAO can be removed quickly by NaOH solution (5~10 wt %) at room temperature, but Al reacts with NaOH slowly, releasing hydrogen.



Al base can be removed by mixture solutions of CuCl_2 and HCl . Typical concentration of CuCl_2 and HCl are 40 wt % and 10 wt %, respectively. The less concentration of the solution, the slower the reaction becomes.

How to remove the AAO template

polymer



Tip:

Large amount of bubbles (H_2) appear after the back AAO being removed by NaOH.



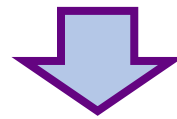
Step 1:

Remove the back AAO by NaOH.



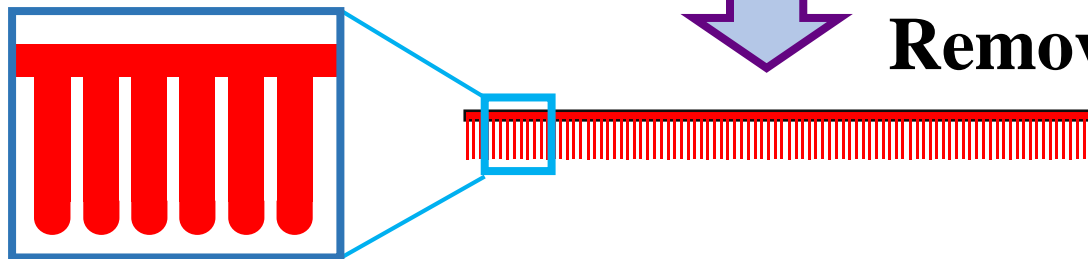
Step 2:

Remove Al base by $CuCl_2/HCl$.

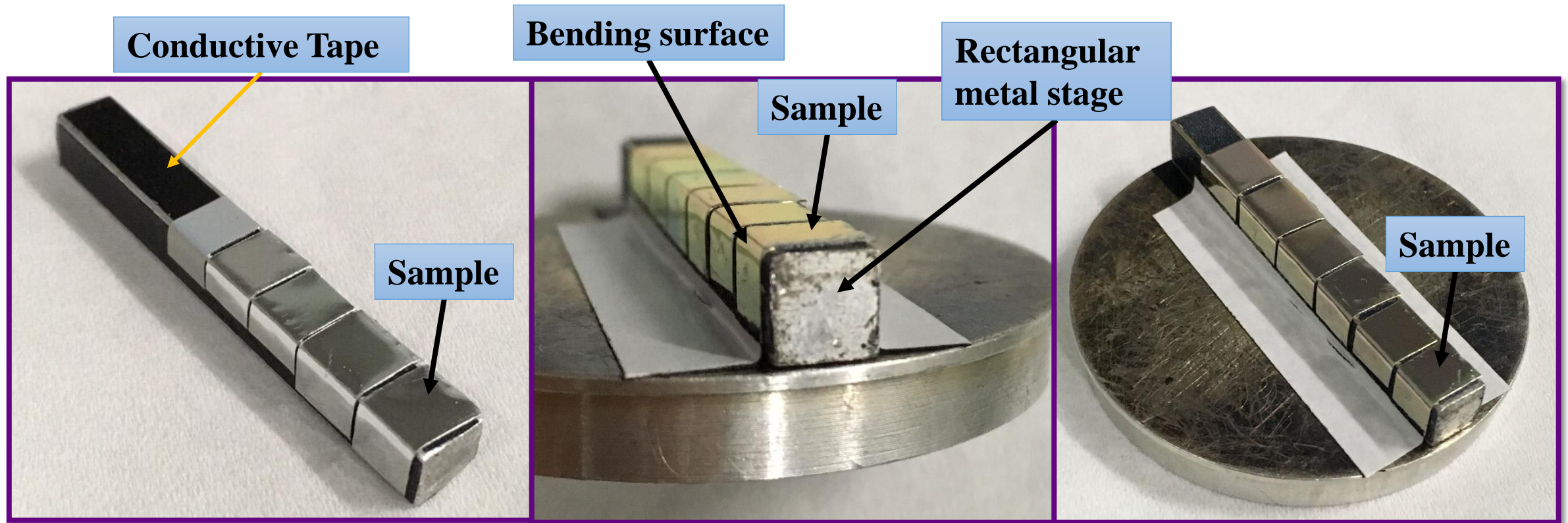


Step 3:

Remove AAO by NaOH.



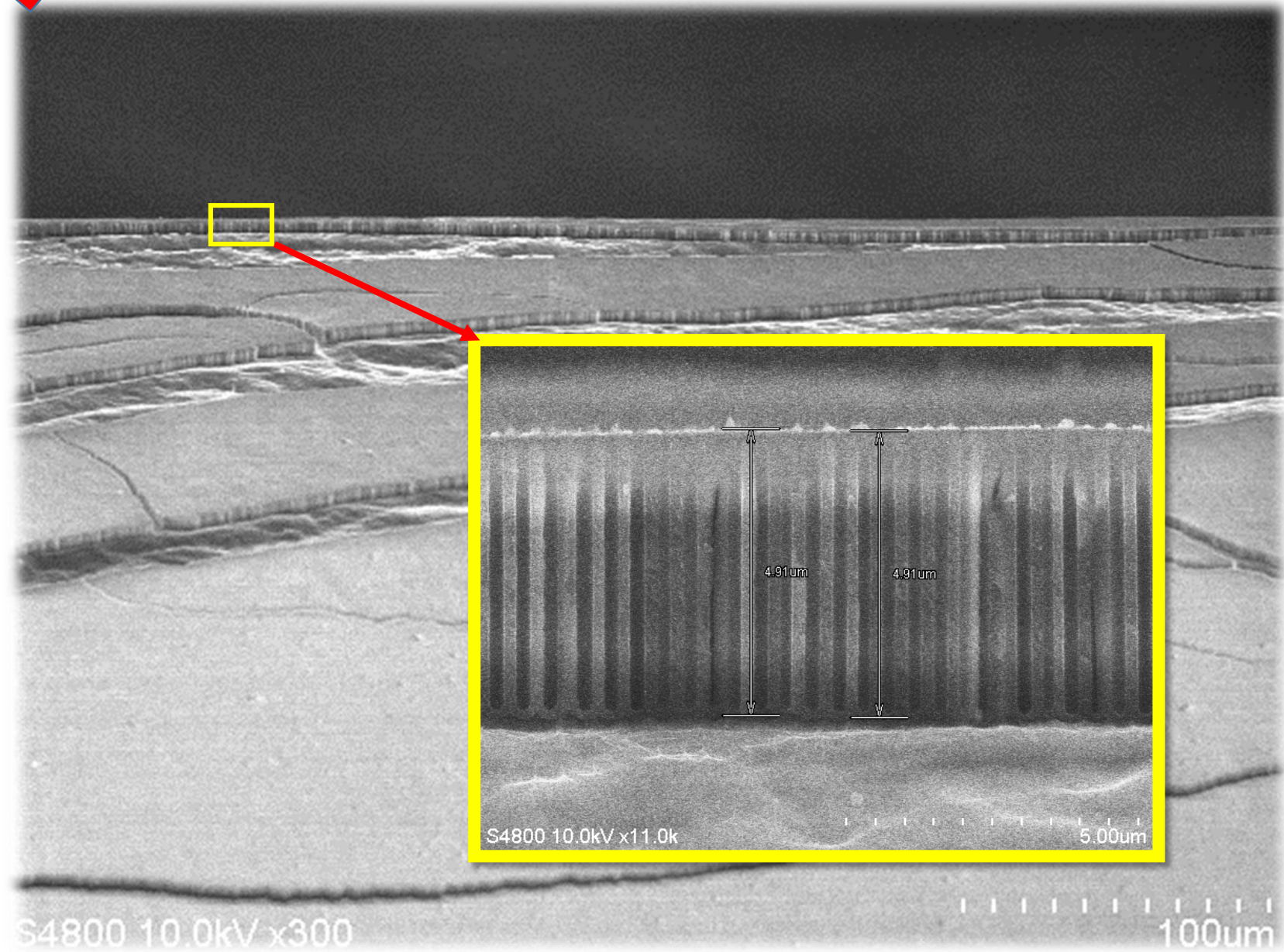
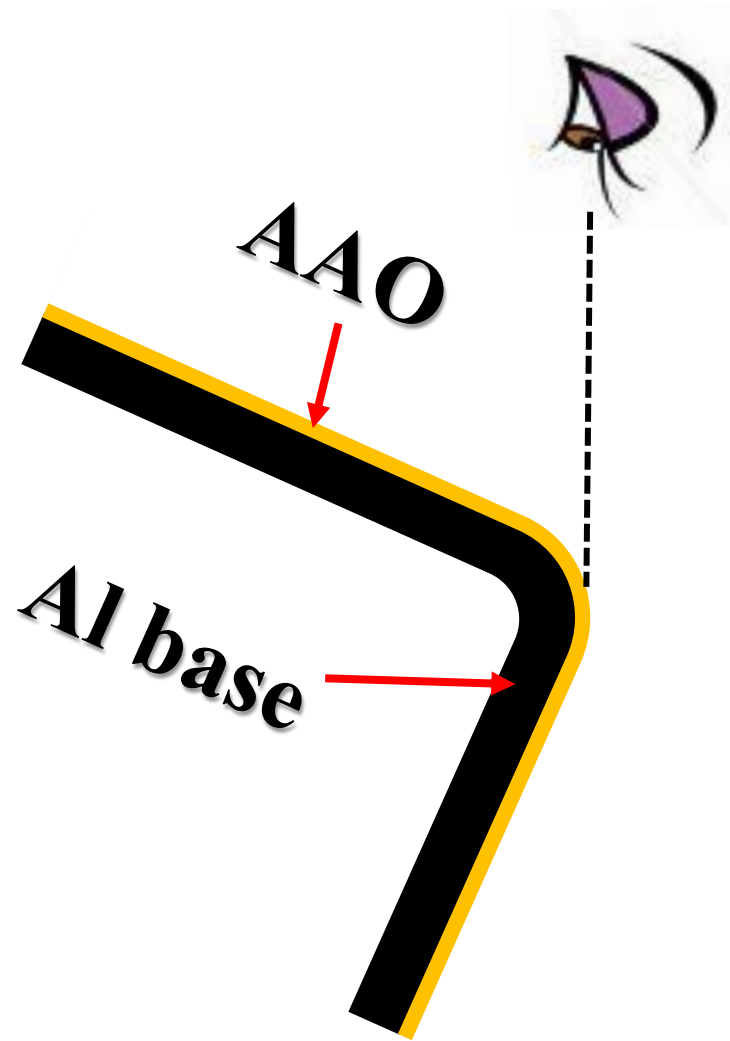
SEM test of AAO on Al substrate



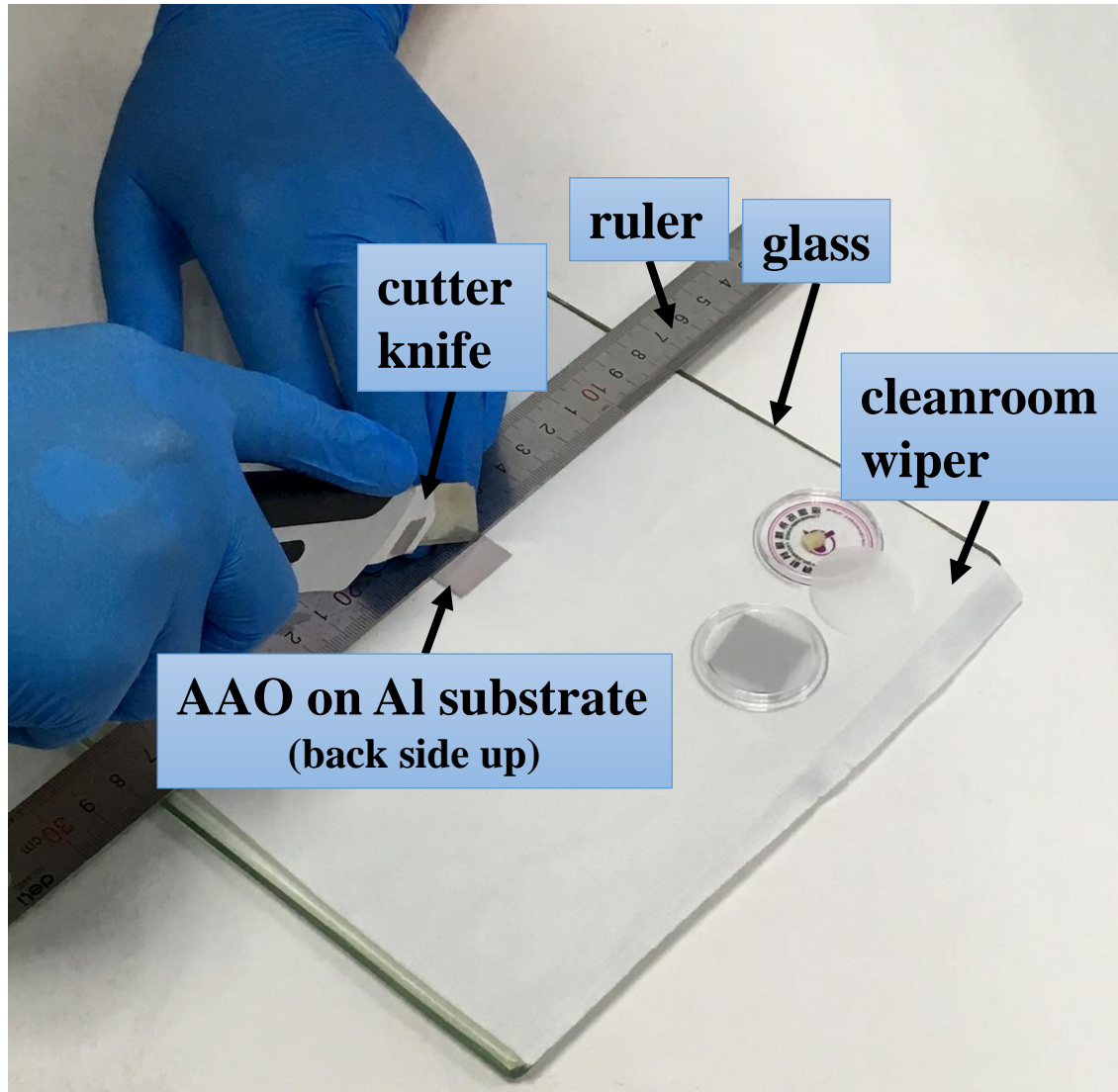
Cracked AAO film is on the bending surface.

Note: the sample can be twisted into 90° to observe the cross section at the area cracked due to bending. But this method is not suitable for AAO template whose pore wall thickness < 20 nm or pore depth > 10μm.

SEM test of AAO on Al substrate



How to cut the AAO template



AAO template: AAO on Al substrate.

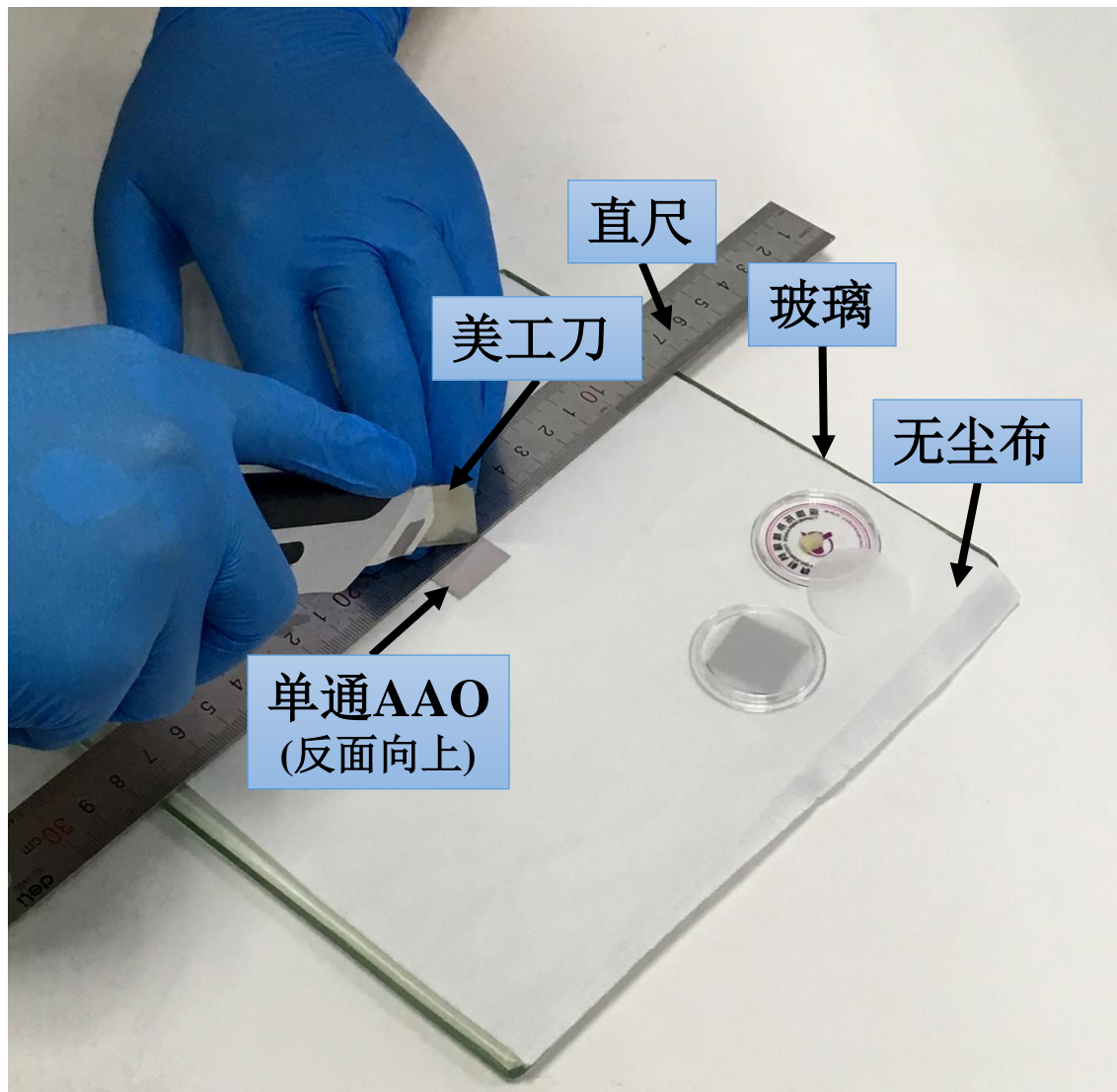
Materials: A metal ruler; A sharp and strong knife; a clean cloth (clean room wiper is suggested, or or other clean soft paper); a hard flat support (glass or steel)

Note: Don't cut the AAO by scissors, or it will curve.

Cutting process:

1. Cover the surface of glass by a piece of cleanroom wiper;
 2. Place AAO on the wiper with backside up (Al side up, AAO side touching the cloth);
 3. Press firmly with the ruler and slice the AAO along the ruler several times;
 4. If AAO is not cut through completely, slowly bend the template until it is set apart;
- ◆ The AAO on Al substrate can be cleaned by ultrasonic cleaning (~1min), using acetone, ethanol, isopropyl alcohol, or deionized water.

How to cut the AAO template (Chinese)



- ◆ 单通AAO的切割不可以使用剪刀，否则AAO会卷曲。
- ◆ 切割方法如右图所示：
 - a) 将干净的无尘布（无尘纸或其它干净而柔软的纸）平铺于玻璃板（或平整的桌面、钢板、木板等）上。
 - b) 将单通AAO取出，反面朝上，正面朝下放置。
 - c) 将直尺按压固定于AAO上。
 - d) 沿着直尺用锋利的美工刀刻划数次。
 - e) 如未完全断裂，可以将单通AAO人沿着切缝来回弯折几次即可断裂。
- ◆ 单通AAO可以放心超声清洗，可以使用丙酮、乙醇、异丙醇、去离子水清洗。