聚焦離子束儀 FIB

一、 簡介：

聚焦離子束/電子束顯微技術的原理為利用離子鎗內擁有小於 10nm 的聚焦離子束離子源，利用此高強度離子源可直寫材料。聚焦離子束的基本系統單元包括離子源、離子光學、基板平台和真空腔體，先進的系統中還包含電子束系統與反應氣體注入系統，離子經由上層鏡組(Upper Lens)被聚焦與準直成平行的離子束，接著離子束經過質量篩選器(Mass Separator)與漂移管(Drift Tube)，質量篩選器是將不要的荷質比離子過濾，只讓正確的荷質比的 Ga+離子通過，下方漂移管裡配有矯正散光的鏡組(Stigmatic Focus Lens)，可以聚焦與準直確保離子垂直的前進，下層鏡組(Lower Lens)接在漂移管之後，用來更進一步聚焦與降低束徑,接著是離子束偏移器(Beam Deflector)用來控制最後離子束聚焦在基板的位置。

二、型號：FEI Helios NanoLab™ 600i

三、規格：

Elstar UHR immersion lens FESEM column
• Elstar electron gun with:
    - Schottky thermal field emitter
    - Hot-swap capability
• 60 degree dual objective lens with pole piece protection
• Heated objective apertures
• Electrostatic scanning
• ConstantPower™ lens technology

Electron beam resolution @ optimum WD
- 0.8 nm at 30 kV (STEM)
- 0.9 nm at 15 kV
- 1.4 nm at 1 kV

Electron beam resolution @ coincident point
- 1.0 nm at 15 kV
- 1.6 nm at 5 kV
- 2.5 nm at 1 kV

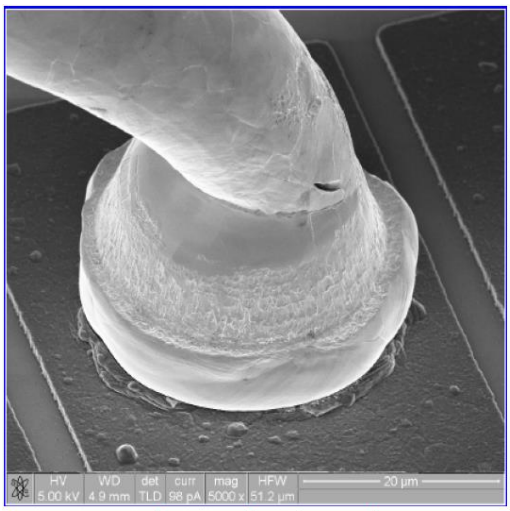
Ion beam resolution @ coincident point
• 4.5 nm at 30 kV using preferred statistical method
• 2.5 nm at 30 kV using selective edge Method

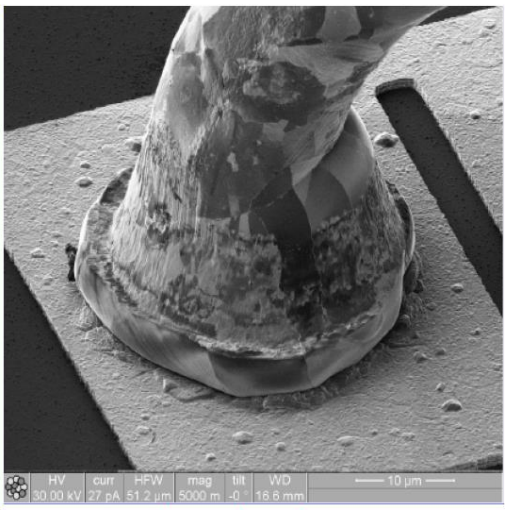
Landing voltage range
• E-beam: 350 V - 30 kV (50V - 30 kV with Beam Deceleration mode option)
• I-beam: 500 V - 30 kV Probe current
• E-beam: up to 22 nA
• I-beam: 1 pA - 65 nA (15 position aperture strip)
High precision 5-axes motorized stage
• XY: 150 mm, piezo-driven
• Z: 10 mm motorized
• T: - 10° to + 60°
• R: n x 360° (endless), piezo-driven
• Tilt accuracy (between 50° to 54°): 0.1°
• X,Y repeatability: 1.0 μm

Sample size
• Maximum size: 150 mm diameter with full rotation (larger samples possible with limited rotation)
• Maximum clearance between stage and coincidence point: 55 mm
• Weight: max. 500 g (including the sample holder

四、典型分析試驗結果：

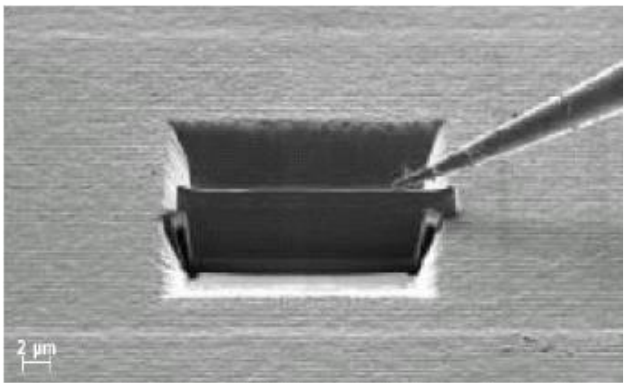
1. 使用聚焦離子束(FIB)作為觀察影像來源：
圖為電子影像與離子影像比較

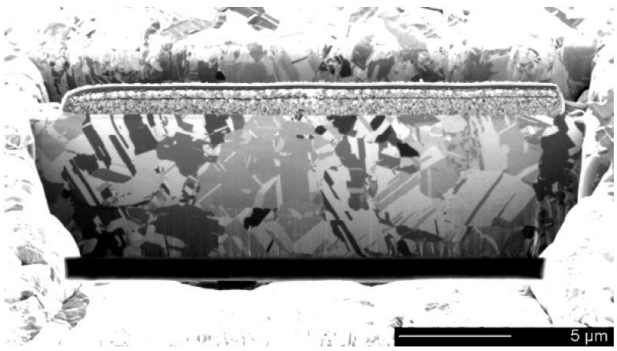




secondary electron image　　secondary ion image

2. 以聚焦離子束製作試片





五、放置位置：工學院綜合大樓 130 室

六、負責技術人員：賴時盈、陳學人