(一)新機介紹：超高解析冷槍場放射型掃描式電子顯微鏡(主機) 含 TE detector 及空氣阻斷系統

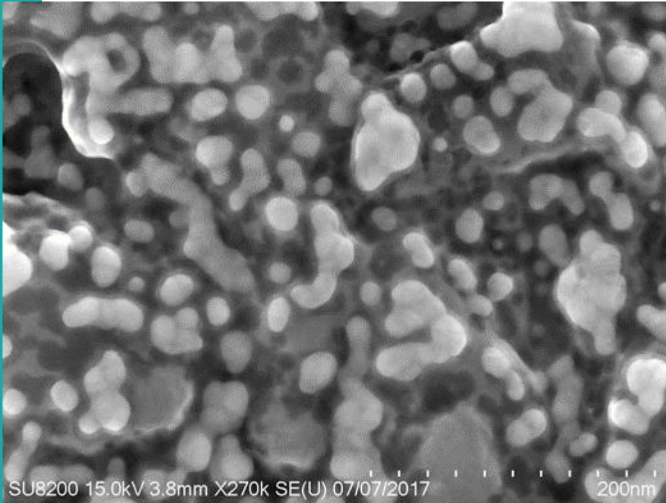
型號: UHR CFE-SEM (SU8220-TE detecting device)

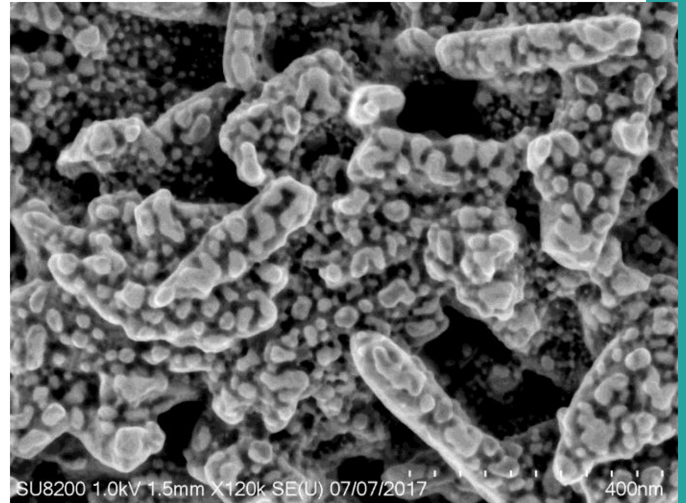
功能簡介：電壓範圍 0.01KV~30KV；解析度高(15KV 達 0.8nm ；1KV 達 1.1nm ；放大倍率最高達 1,000,000X；樣品移動為五軸全自動式;備有減速電壓(Landing voltage)降低電子束對樣品的破壞;同時具有頂部、上、下 三組二次電子偵測器與背向電子訊號偵測器並搭載穿透電子偵測裝置 TE Detecting Device (Aperture For Bright/Dark Field STEM / STEM Holder)可以同時同地觀測 SEM+TEM-BF+TEM-DF 影像。另外具有可與離子切割研磨機(HITACHI IM4000+)相容之空氣阻斷系統(Air protection unit)可達樣品由製作-切割-觀測分析皆處於真空狀態。

樣品實測:

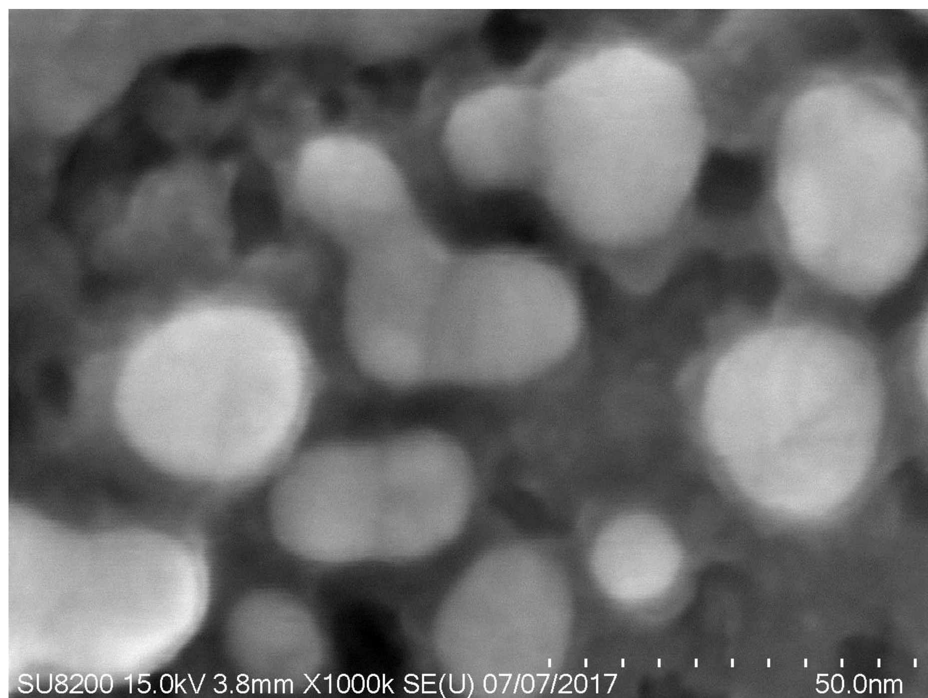
(1) UHR CFE-SEM (SU8220)部份(UN-COATING)

A. 標準的 SU8220 驗機解析度影像

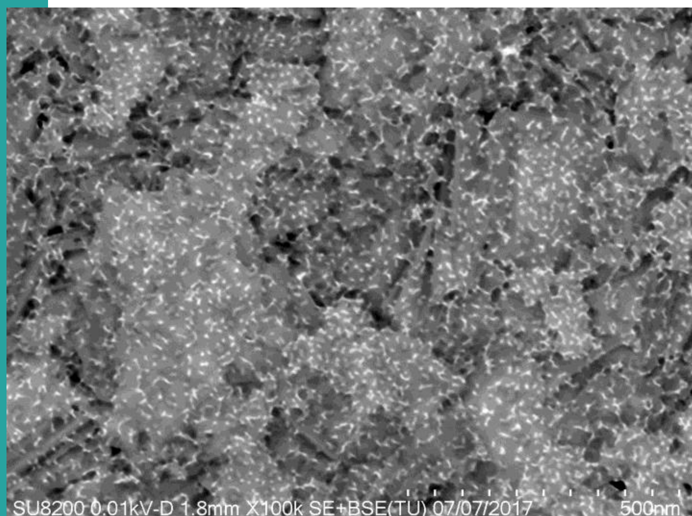


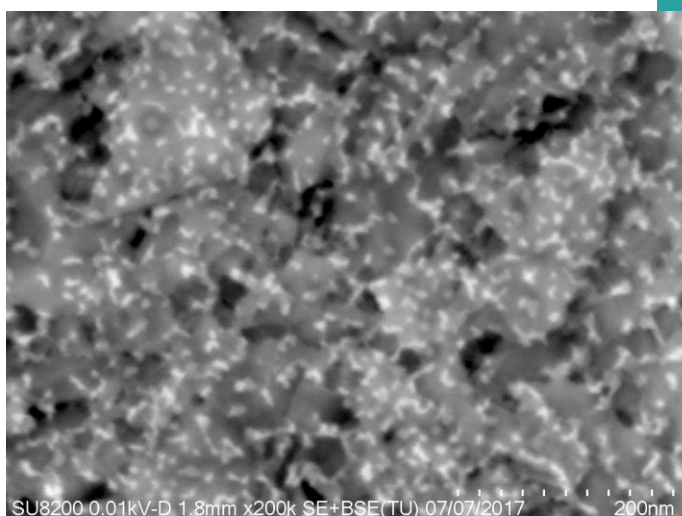


B. SU8220 最高放大倍率影像 (1000K)

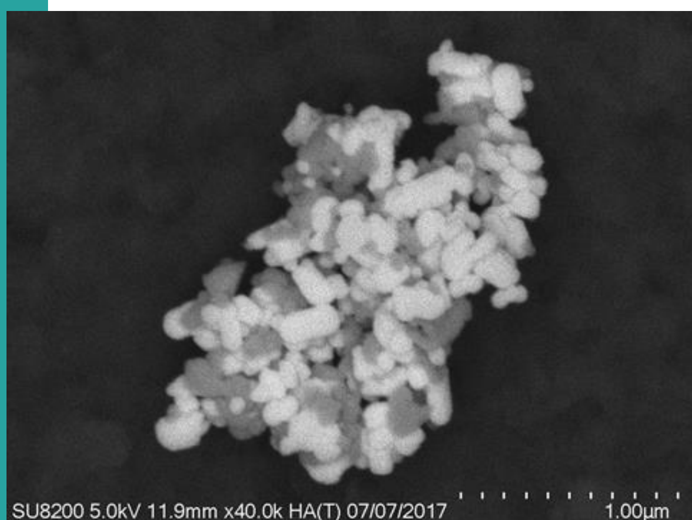


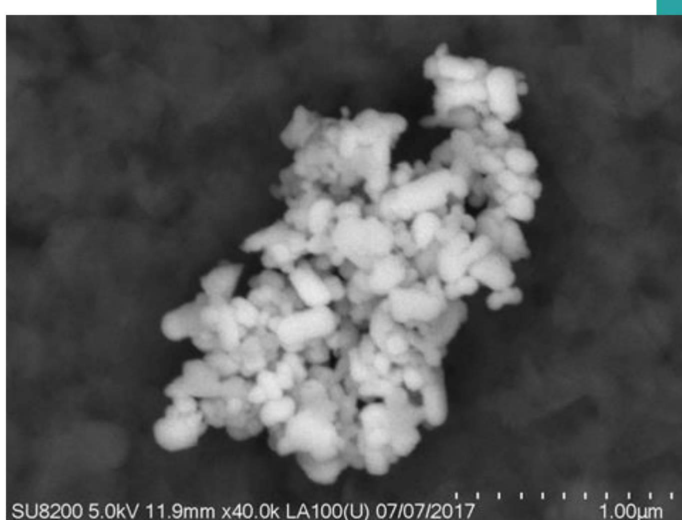
C. SU8220 減速電壓影像 (最低加速電壓為 10V)





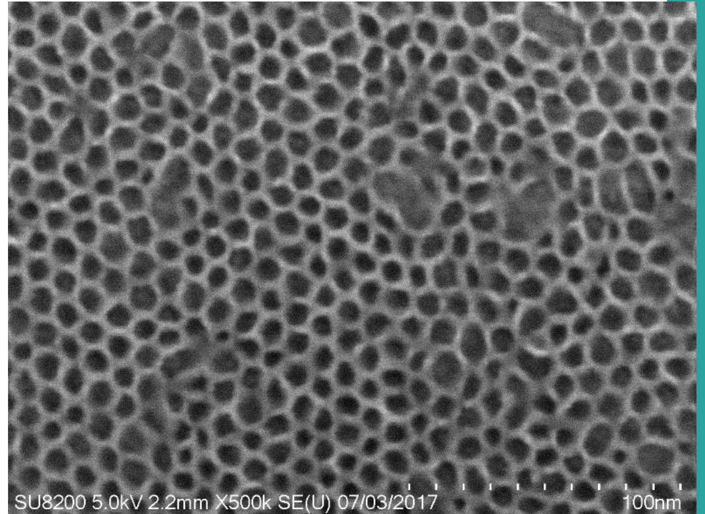
D. SU8220 三組二次電子偵測器 (TOP、UPPER 和 LOWER)



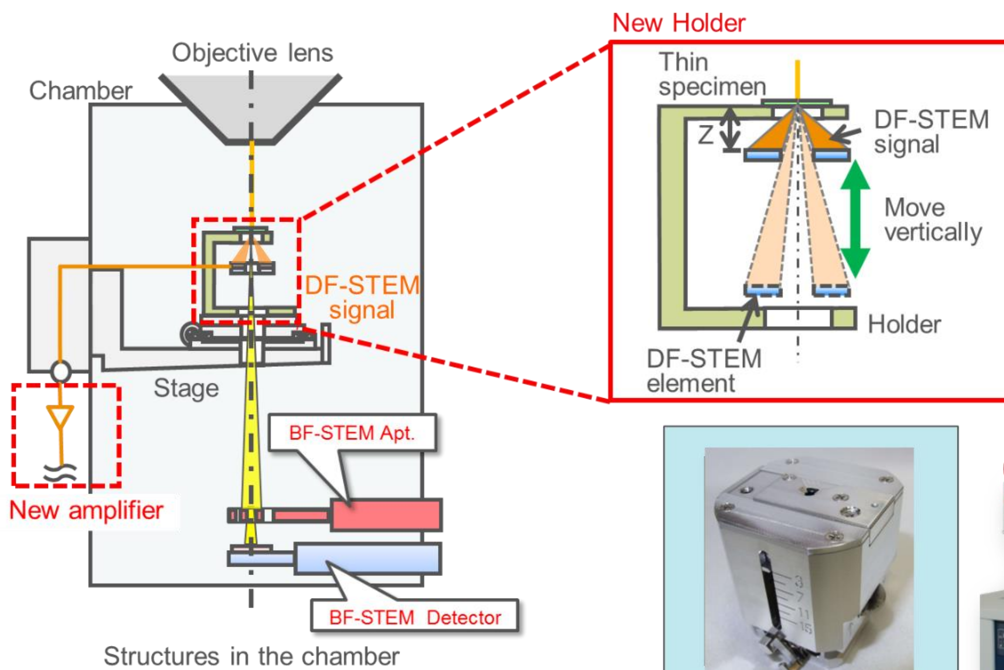


TOP 偵測器觀察的影像其組成相對比較明顯;LOWER 偵測器觀察的 SE(L)影像，其為 3D 立體影像。

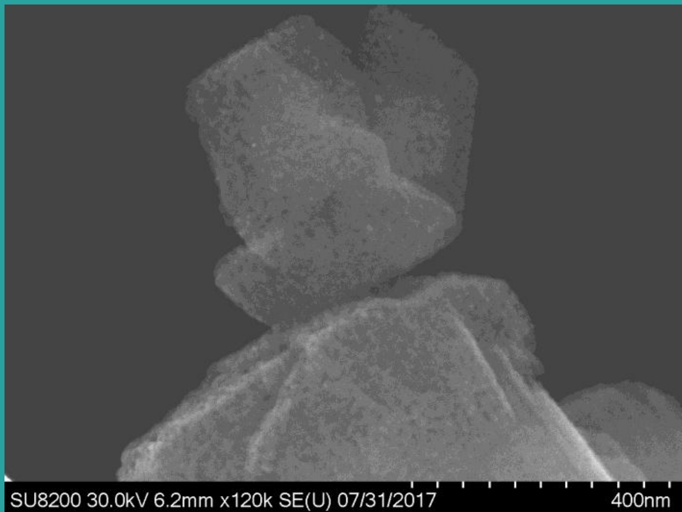
E. SU8220 超微孔影像

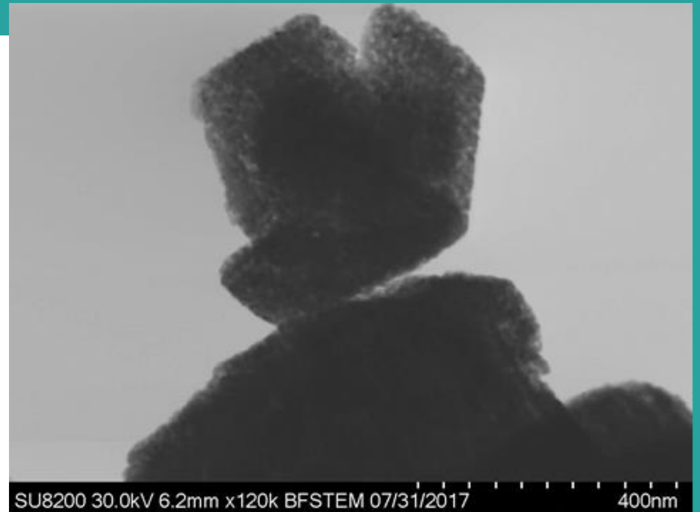


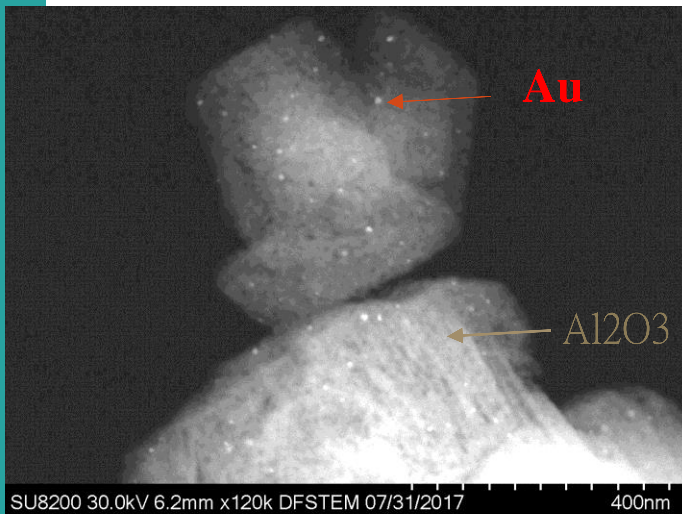
F. SU8220 STEM 影像(同時同地觀測 SEM+TEM-BF+TEM-DF)



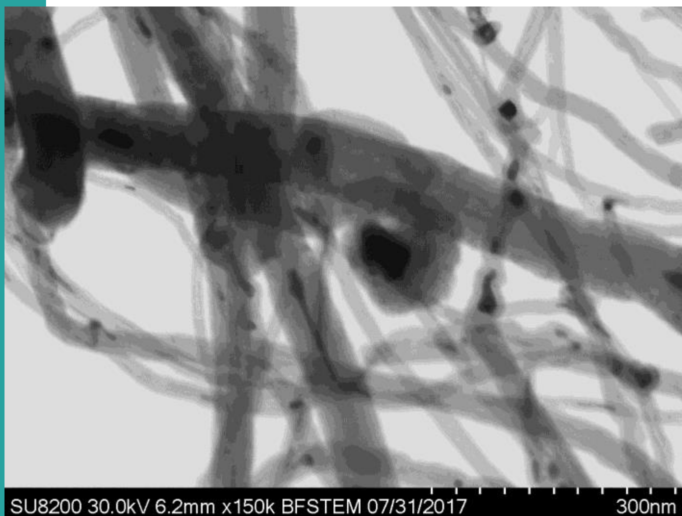
DF-STEM Holder

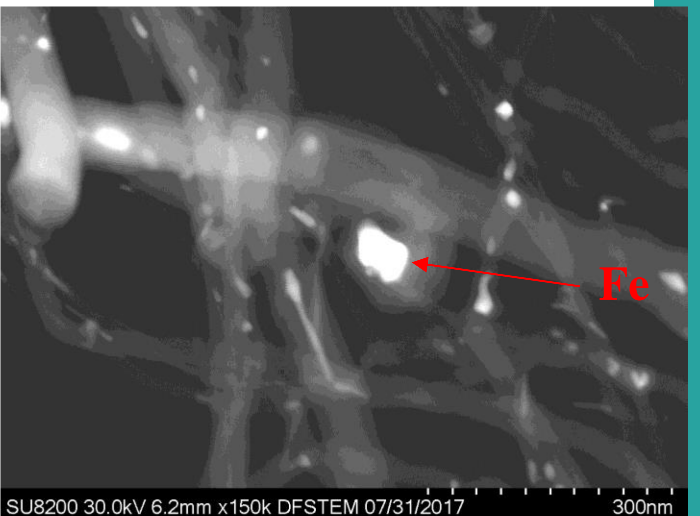


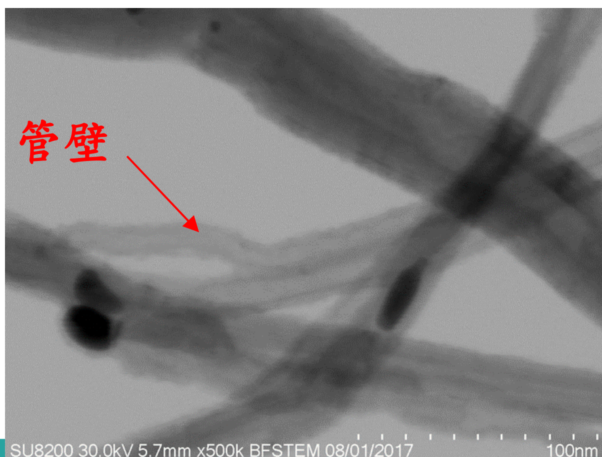


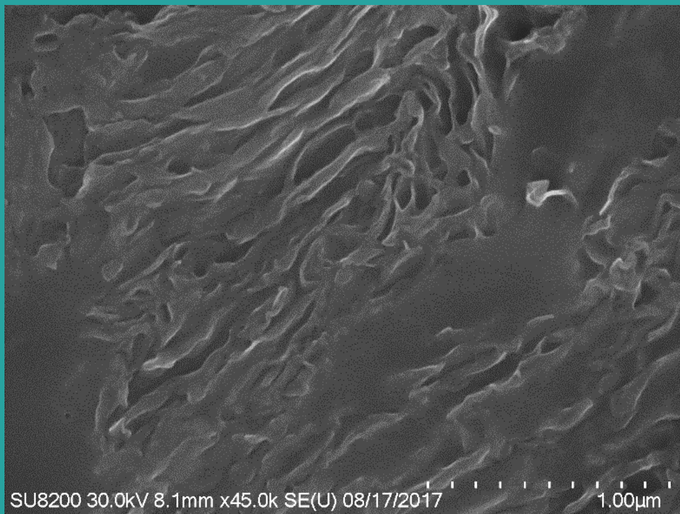


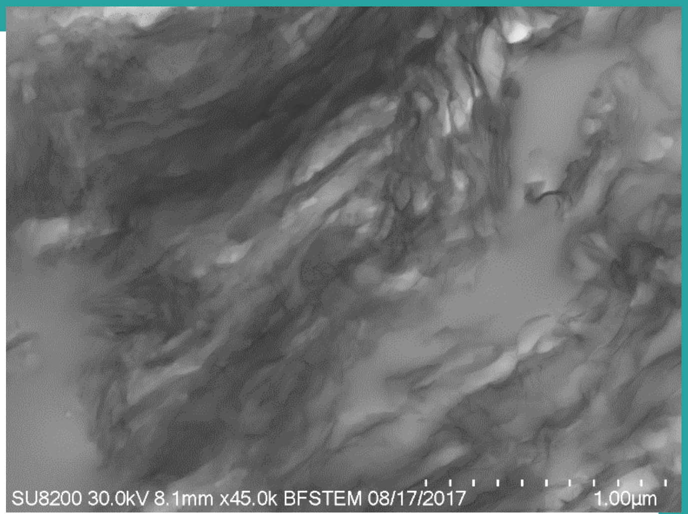
TEM 粉末樣品，製備於一般鍍碳銅網上直接進 SU8220 TE DETECTING DEVICE。

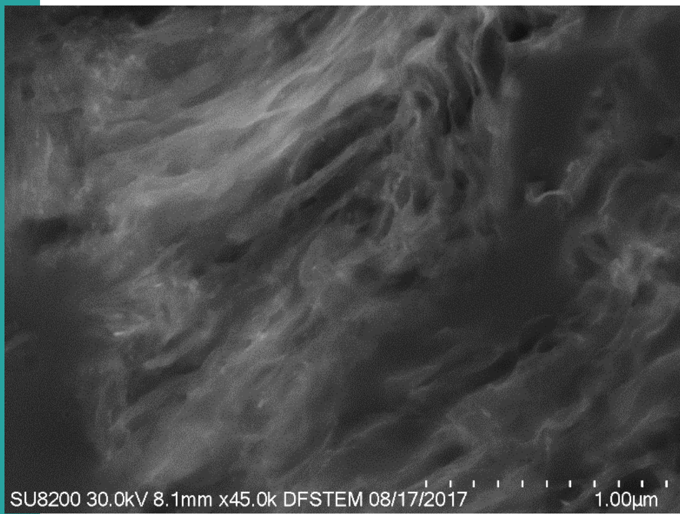


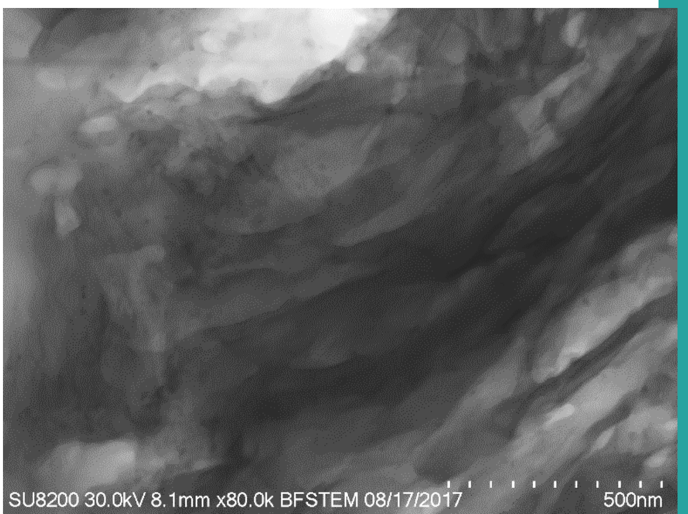


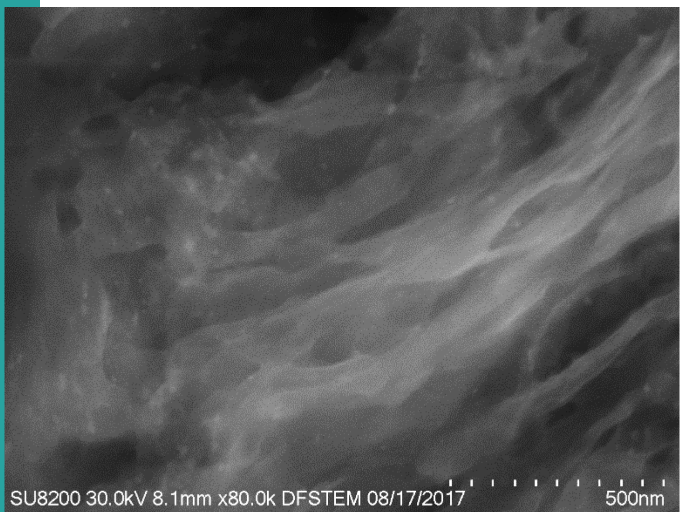


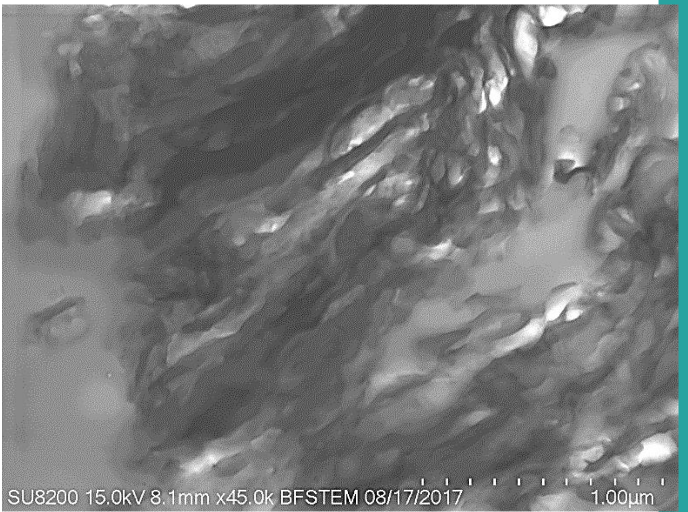


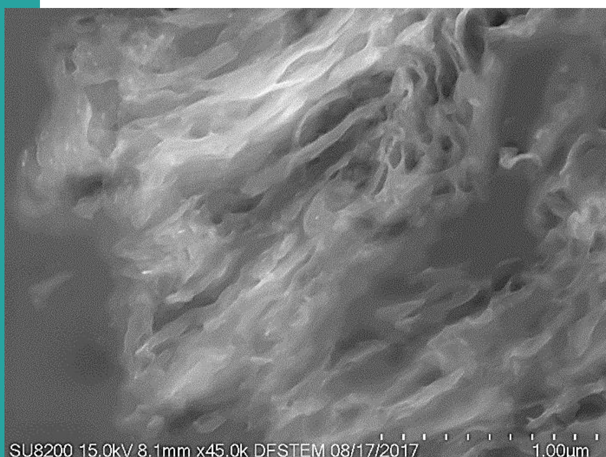




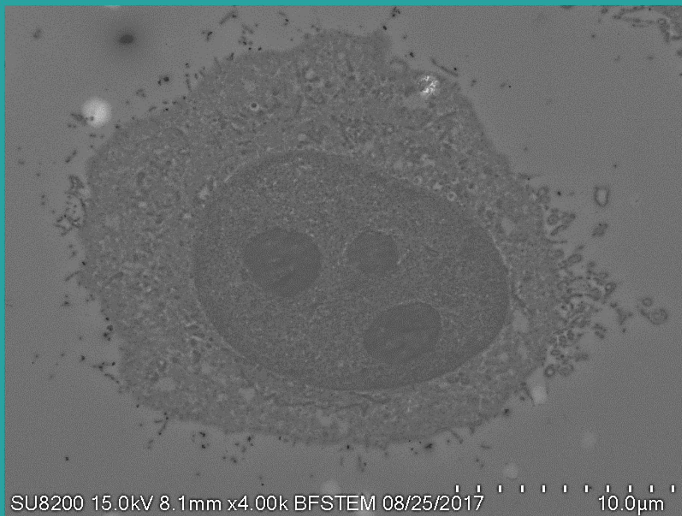


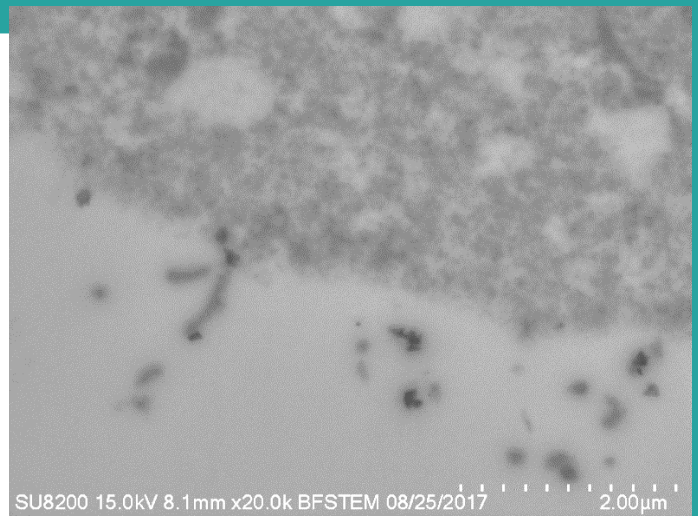


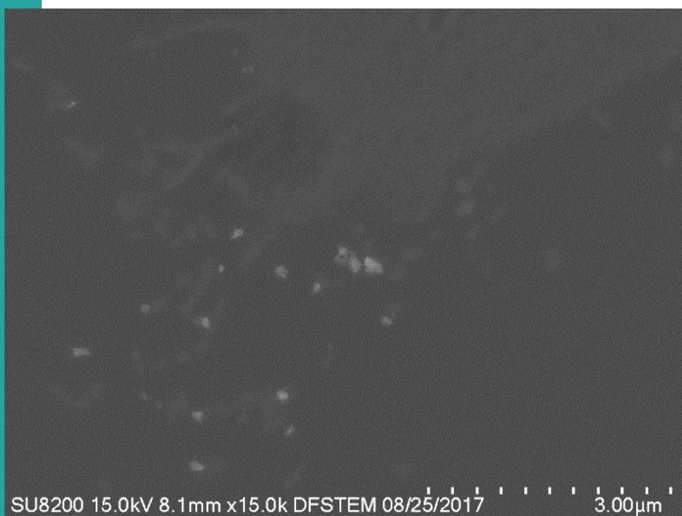


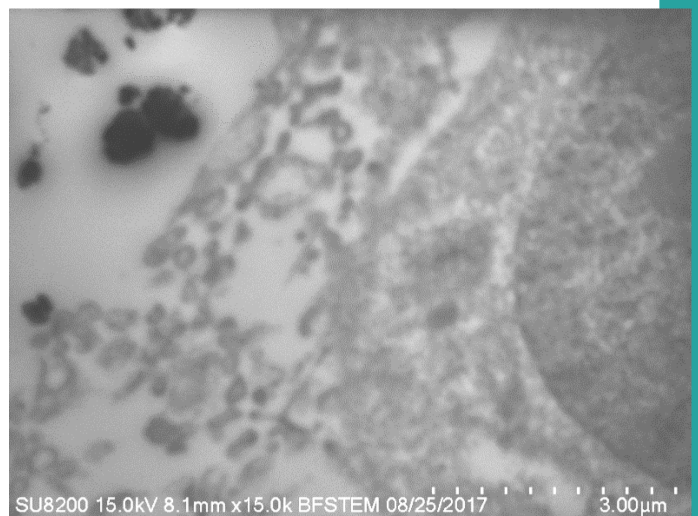


高分子樹脂內含 GO 之 TEM 超薄切片樣品，製備於一般鍍碳銅網上直接進 SU8220 TE detecting device; 使用 15KV 亦可穿透並觀測。

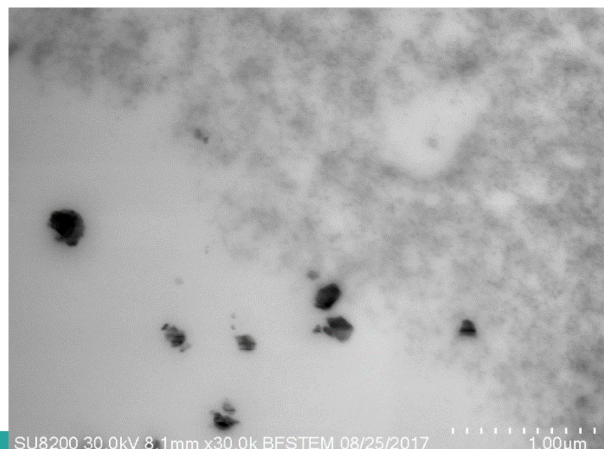


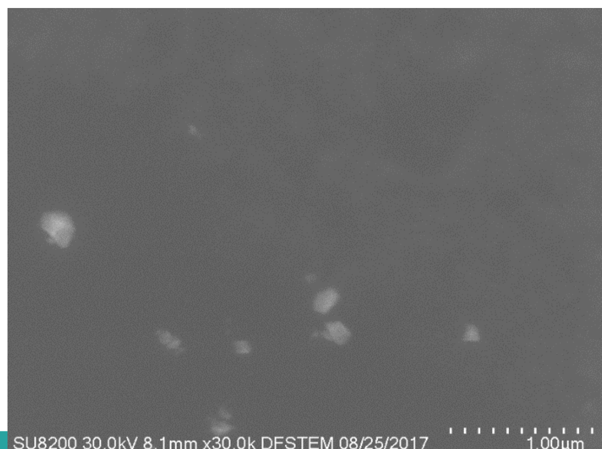






結晶奈米顆粒與纖維狀細胞間作用情況之 TEM 未染色超薄切片樣品，製備於一般鍍碳銅網上直接進 SU8220 TE detecting device; 使用 15KV 亦可穿透並觀測。

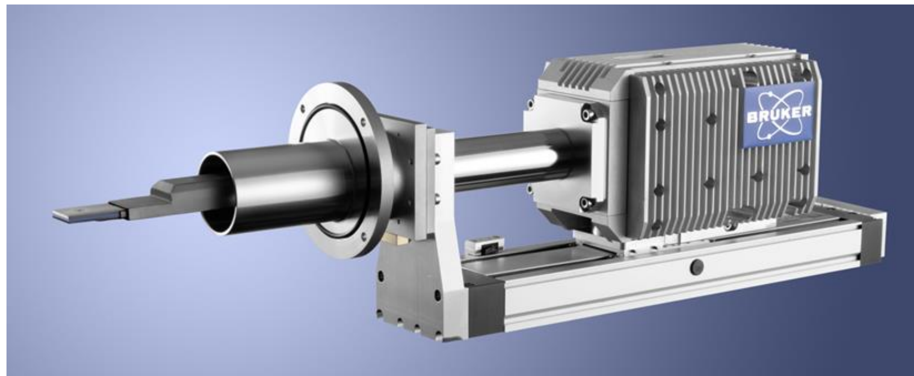




(二)新機介紹: X 光能量分散光譜儀

型號: QUANTAX ANNULAR XFLASH® QUAD FQ5060

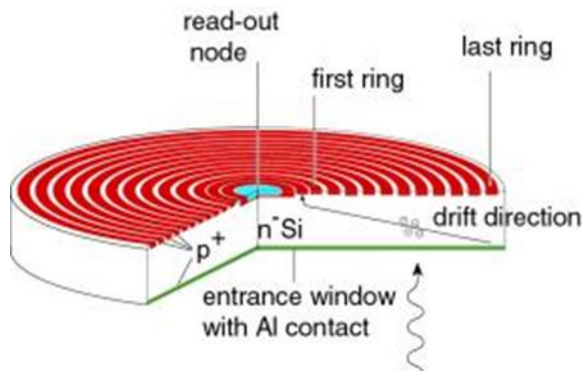
功能簡介:微區顯微成分之定性及半定量分析(Spectrum Quantification)、多點分析(Objection Quantification), 線分析(Line Scan) 及面元素分佈分析 (Mapping)

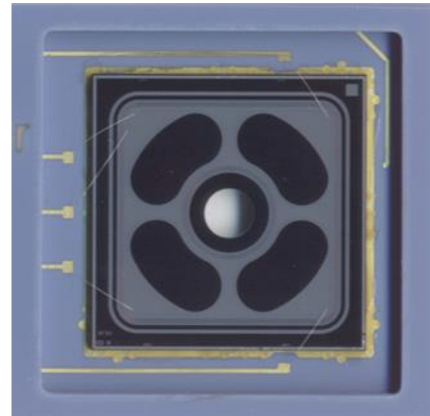


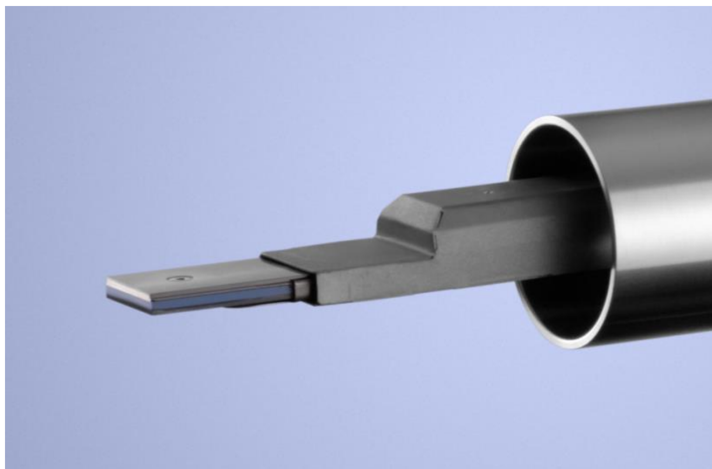
儀器規格

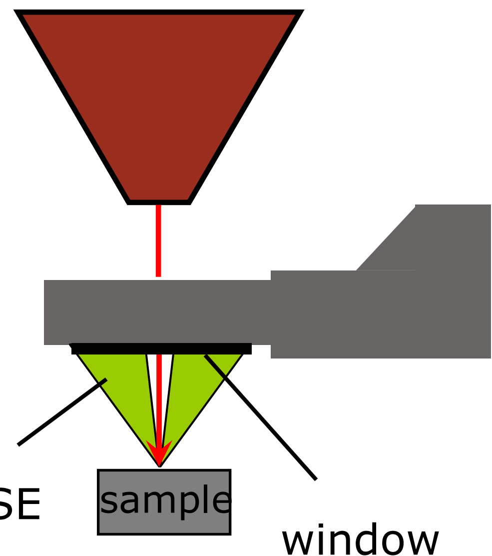
- **Active area(訊號接收面積)：60 mm2 (4 x 15 mm2)**
- **Detection element(偵測元素範圍)： Boron (z=5) to Americium (z=95)**
- **Energy resolution(能量解析度)：≤124 eV (MnKα, 100 000 cps)**
- **Maximum input count rate(最大訊號接收量)：> 2 million cps**
- **Cooling(冷卻方式)：Peltier cooled**
- **Quantification Software 定量軟體—ESPRIT 2.0 版**
- **Objection, Line Scan and Mapping 多點/區分析, 線分析及面元素分佈分析**

偵測器種類: Silicon Drift Detectors





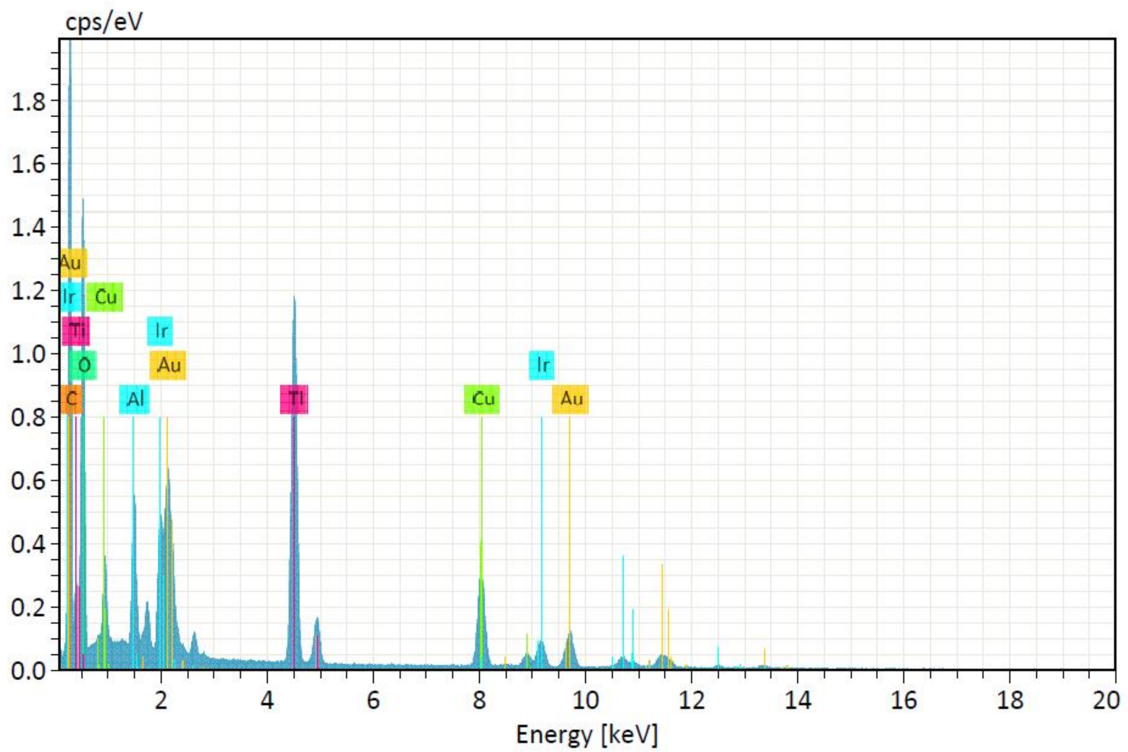




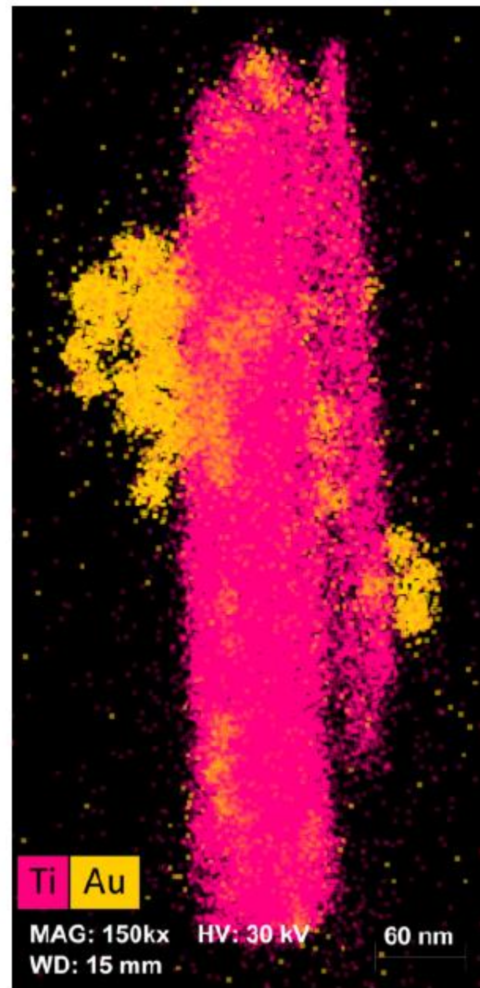
- Detector is equipped with a polymer window
- Influence of BSE needs special treatment in this geometry
- Electron trap cannot be used
- Depending on acceleration voltage BSE can affect the quality of the spectrum
- Thick polymer or Be window will block high energy BSE, e.g. HV=20kV, but will reduce low energy X-ray detection
- Thin polymer window: will enhance low energy efficiency but will only block BSE up to a certain HV

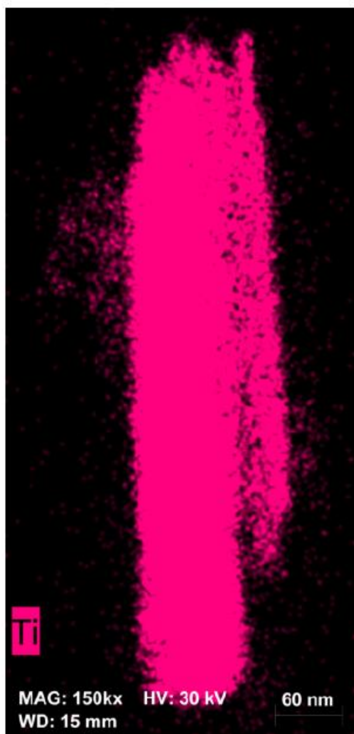
樣品試作分析

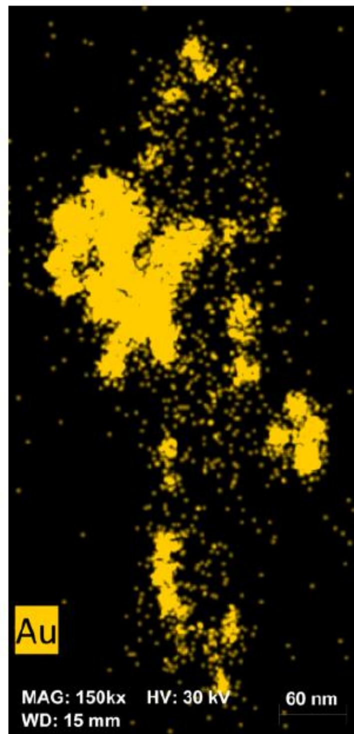
Application Note
Company / Department

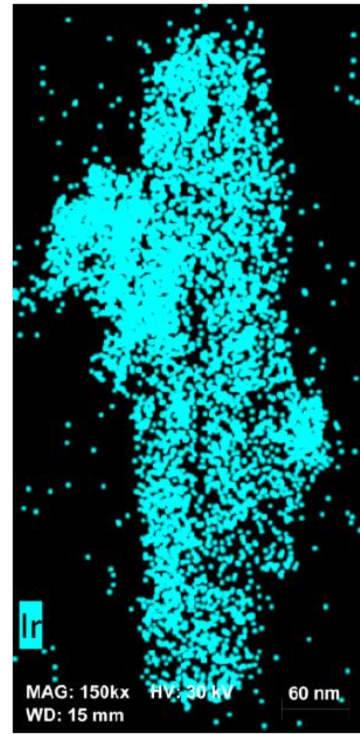


MAG: 150kx HV: 30 kV
WD: 15 mm
60 nm


Ti
Au
MAG: 150kx HV: 30 kV
WD: 15 mm
60 nm


Ti
MAG: 150kx HV: 30 kV
WD: 15 mm
60 nm


Au
MAG: 150kx HV: 30 kV
WD: 15 mm
60 nm


Ir
MAG: 150kx
WD: 15 mm
60 nm

(三) 新機介紹: 離子切割研磨機含冷凍控溫及空氣阻斷系統

(Ion Milling with Cooling control unit and Air Protection System)

型號: IM4000 Plus

功能簡介:同時具有切割與研磨功能，利用氬氣來進行切割並結合液態氮控溫系統(控溫範圍:0~-100℃)。本設備同時具有空氣阻斷系統可以與 UHR CFE-SEM (SU8220-TE detecting device)相容，達到樣品由製作-切割-觀測分析皆處於真空狀態。

儀器規格

(1) Ion Gun 離子槍
- a) Gas 氣體：Argon gas 氬氣
- b) Acceleration Voltage 加速電壓：0 to 6kV

(2) Cross-section polish 離子切割模式
- a)切割速率：>500µm/hr.
- b)試片尺寸：最大尺寸 20W x 12D x7H (mm)

(3) Flat milling 離子研磨模式
- a)研磨速率：>20µm/hr
- b)試片尺寸：最大尺寸 Φ50 x25H (mm)

(4) Cooling Temperature control unit 溫控系統
- a)冷卻源： LN2
- b)控溫範圍：0 to 100˚C

(5) Alignment System 對位系統: 配備高解析數位變倍顯微鏡對位系統

(四) 新機介紹：桌上型 SEM 試片清潔機(DESKTOP SEM SAMPLE CLEANER)

型號: Hitachi Zone SEM

功能簡介：屬於軟性材料清潔保護設備 (UV CLEANER)，為非破壞性清潔方法，主要針對目標表面的碳氫化合物污染以達到顯露精細表面特徵，降低並消除了 ELECTRON BEAM INDUCED DEPOSITION (EBID)現象，進而提高成像和分析品質。

儀器原理