Advantage of Hitachi S-3000 series



Hitachi High-Technologies Corporation

Nano Technologies Sales Dept.

Hitachi Scanning Electron Microscope
Model: S-3600N



S-3600N

Outline

Resolution: 3.0nm (HV mode)

30nm (Low Vacc.)

4.5nm(VP mode)

Max sample size: 10inch fai

(254mm fai)

1) Large sample chamber (Max 10inch fai)

vs JSM6460LV (8inch fai)

2) Max sample thickness capability (Max: 70mm)

Max sample weight capability (Max: 2.0kg)

vs JSM6460LV (Max 1.0kg)

3) 5 axis auto large stage (X/Y : 150mm/110mm)

vs JSM6460LV (X/Y : 125mm/100mm)

4) Resolution guarantee at low Vacc. (3kV)

30nm at 3kV guaranteed (with Dual bias mode)

vs JSM6460LV : No guarantee

Feature and Advantage

1) **Ease "view seeking & friendly monitor**

   with "TV Scan mode" / "Full Screen function"

2) **Frequent "Data capture" & "Save"**

   with "Capture button" and "Capture box"

3) **4-segment Semiconductor type BSE Detector**

4) **High contrast imaging at low accelerating voltage**

   with "Dual Bias function"

5) **Easy and Friendly "Maintenance assist function"**

   with "3D CG Maintenance guide"

   with "Liner tube system"

6) **"ESED" Environment Secondary Electron Detector**

“TV Scan mode” / “Full Screen function”

SEM operator takes their time for “View Seeking” and “Data save” in their SEM operation.

With Hitachi SEM

To develop the Scanning mode at “TV rate”

→ **Quick view response**

To develop the “Full Screen mode”

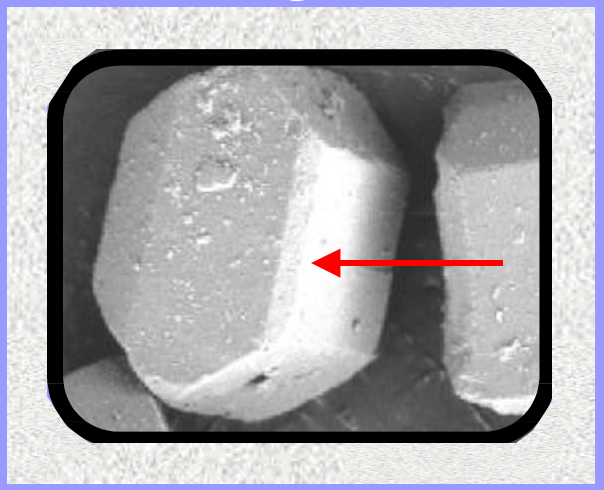
→ **Real-time wide monitoring**

No functions in JEOL

W TV Scan mode (NTSC standard)

Scan rate : **Hitachi : 0.033sec. / flame** vs **Jeol : 0.142sec. / flame**

Viewing monitor



Hitachi



Moving



JEOL

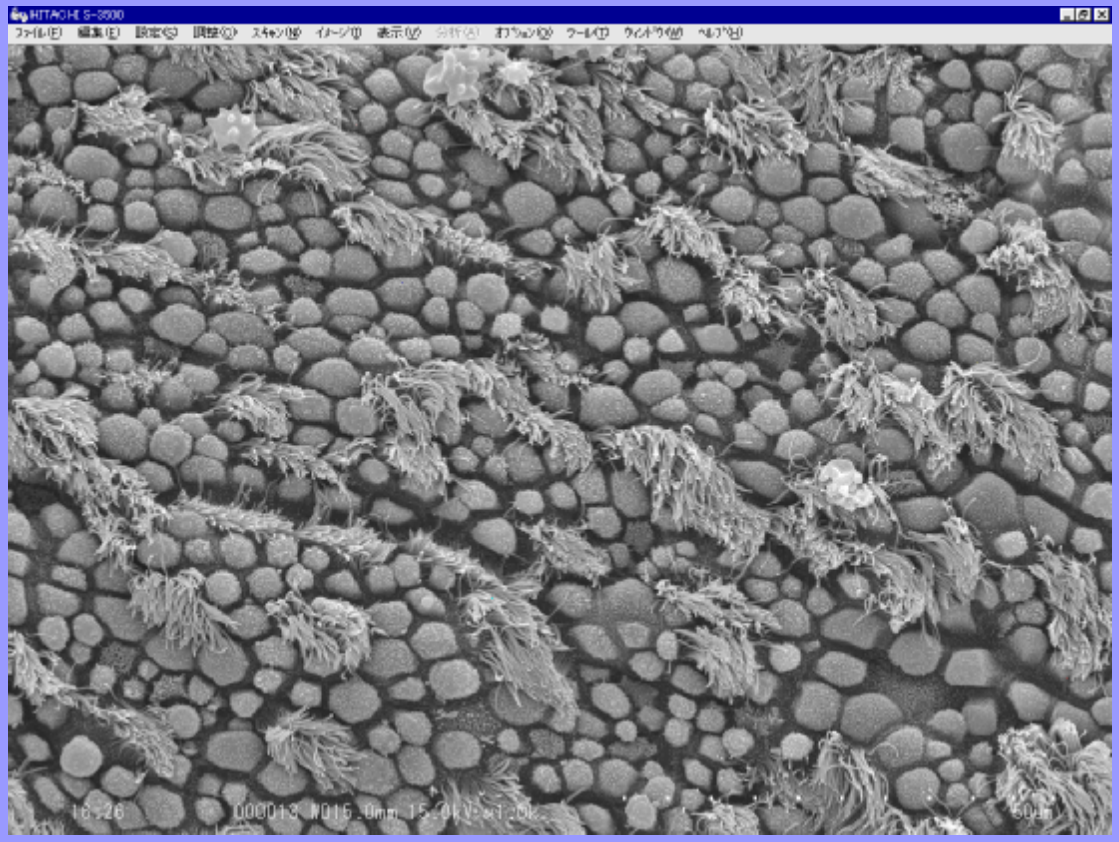
Slow Scanning can entail after-image as left

W Full (Live) Screen Mode

Live image can be displayed on full screen

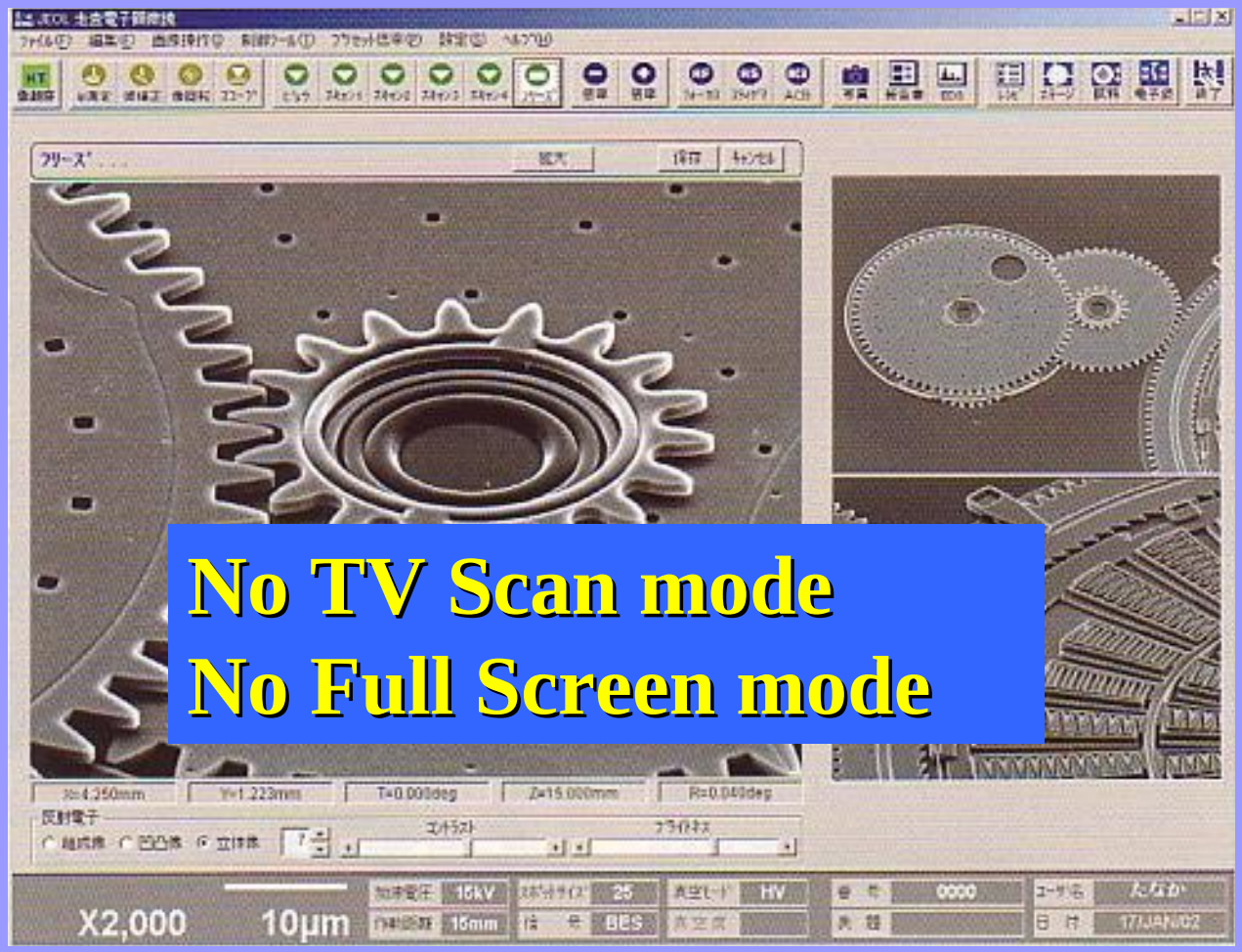
(1,024 x 768 pixels.)

Hitachi S-3xxx series



JEOL can display only “saved image”, not “Live image” on full screen.

* S-3000 series : option



JEOL’s JSM-6xxx series

“Capture button” / “Capture BOX”

SEM operator takes their time for “View Seeking” and “Data save” in their SEM operation.

With Hitachi SEM

1) **Live image can be captured by “one” button click easily at any scan mode.**

Captured image can be stored in “Captured box” as a digital data.

Captured time : Hitachi (40sec. / 80sec.) vs JEOL (80sec. / 120sec.)

Too long. You can’t wait so long.

2) **“Captured box can store a lot of images all together.**

You can select required images after capture.

You don’t need to save images to PC every capture time.

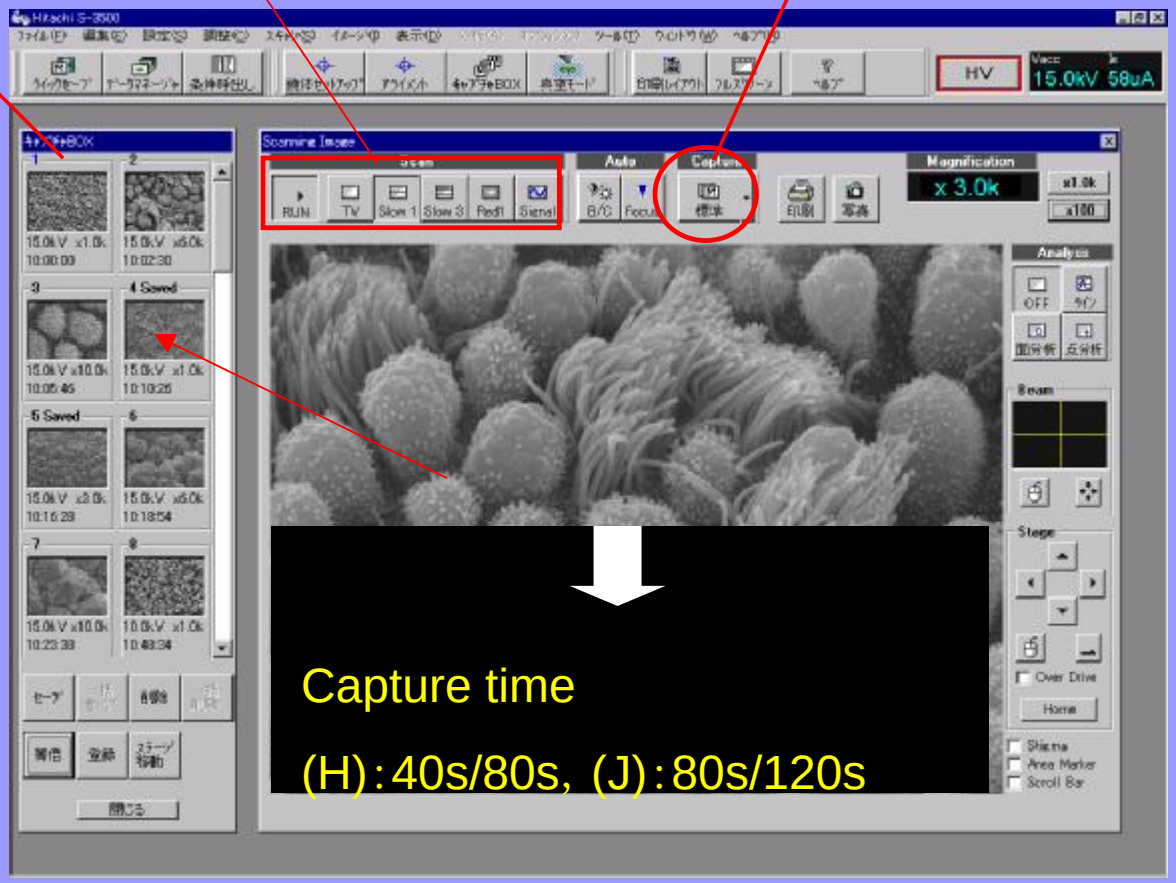
High throughput → less sample damage

W Capture button / Capture Box

Any scan mode is available

Capture button

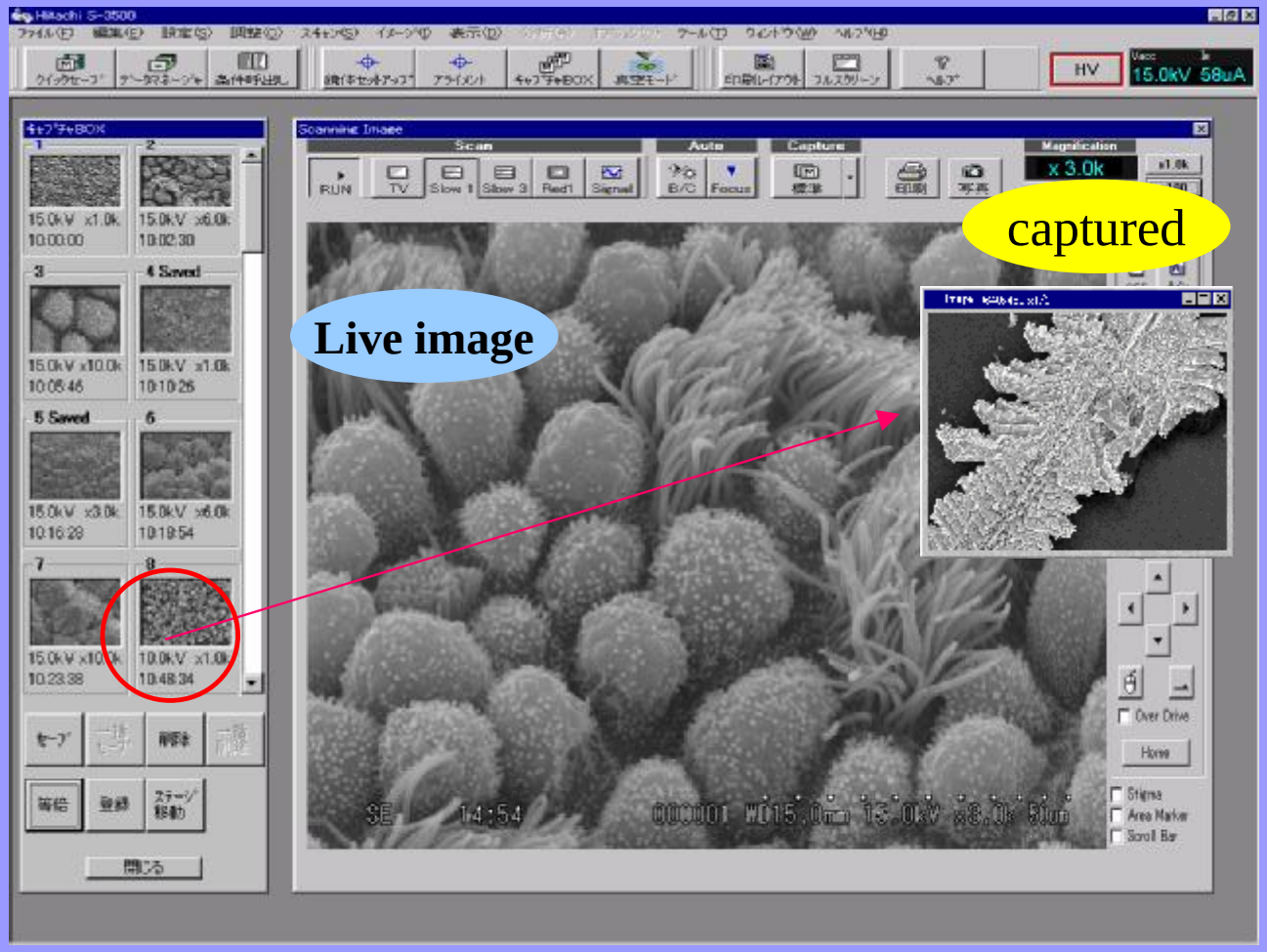
Capture box



W Capture Box (Sub function)

Dual display (Live image / captured image) is available simultaneously.

It is useful for comparison between two images.

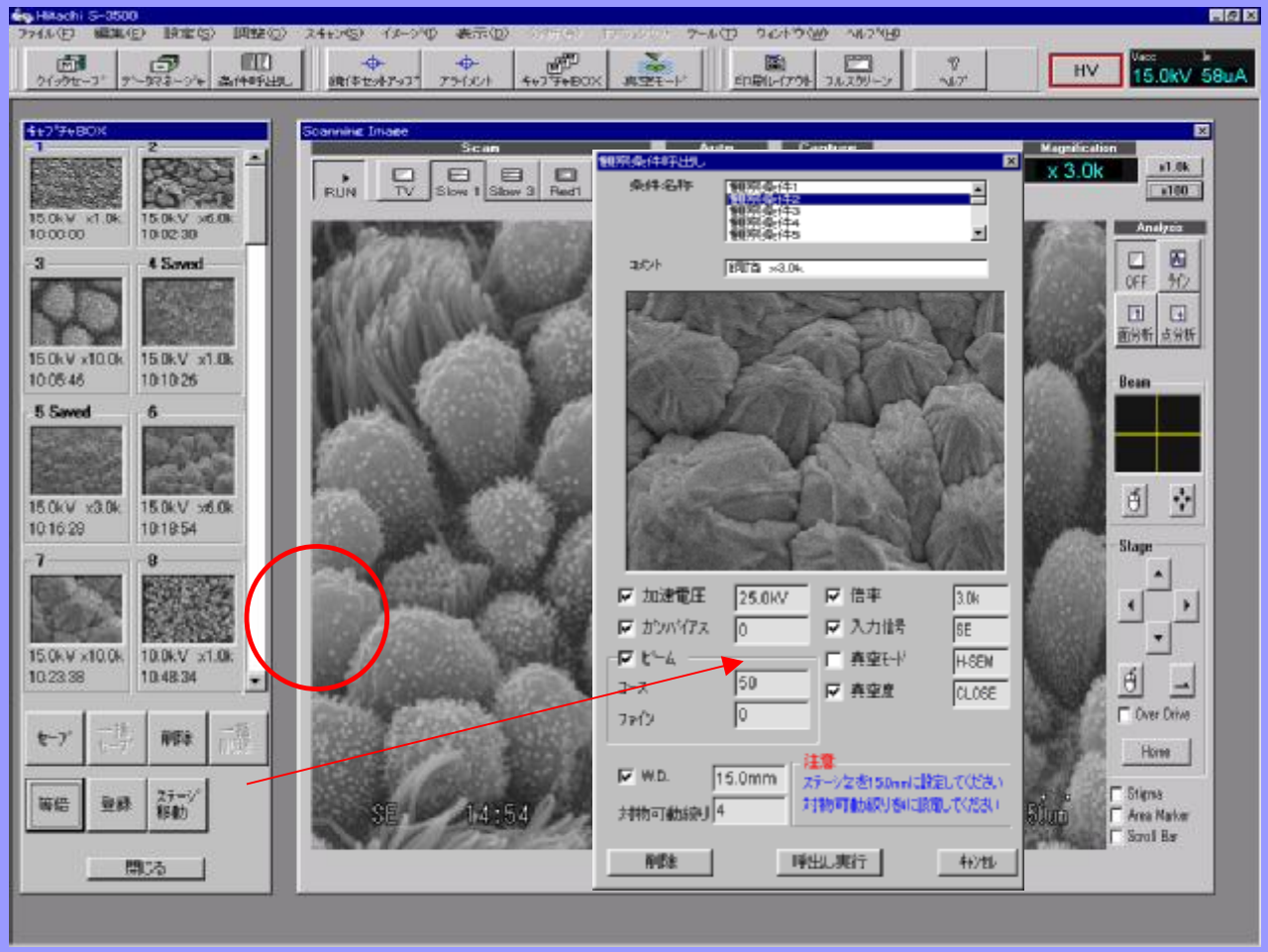


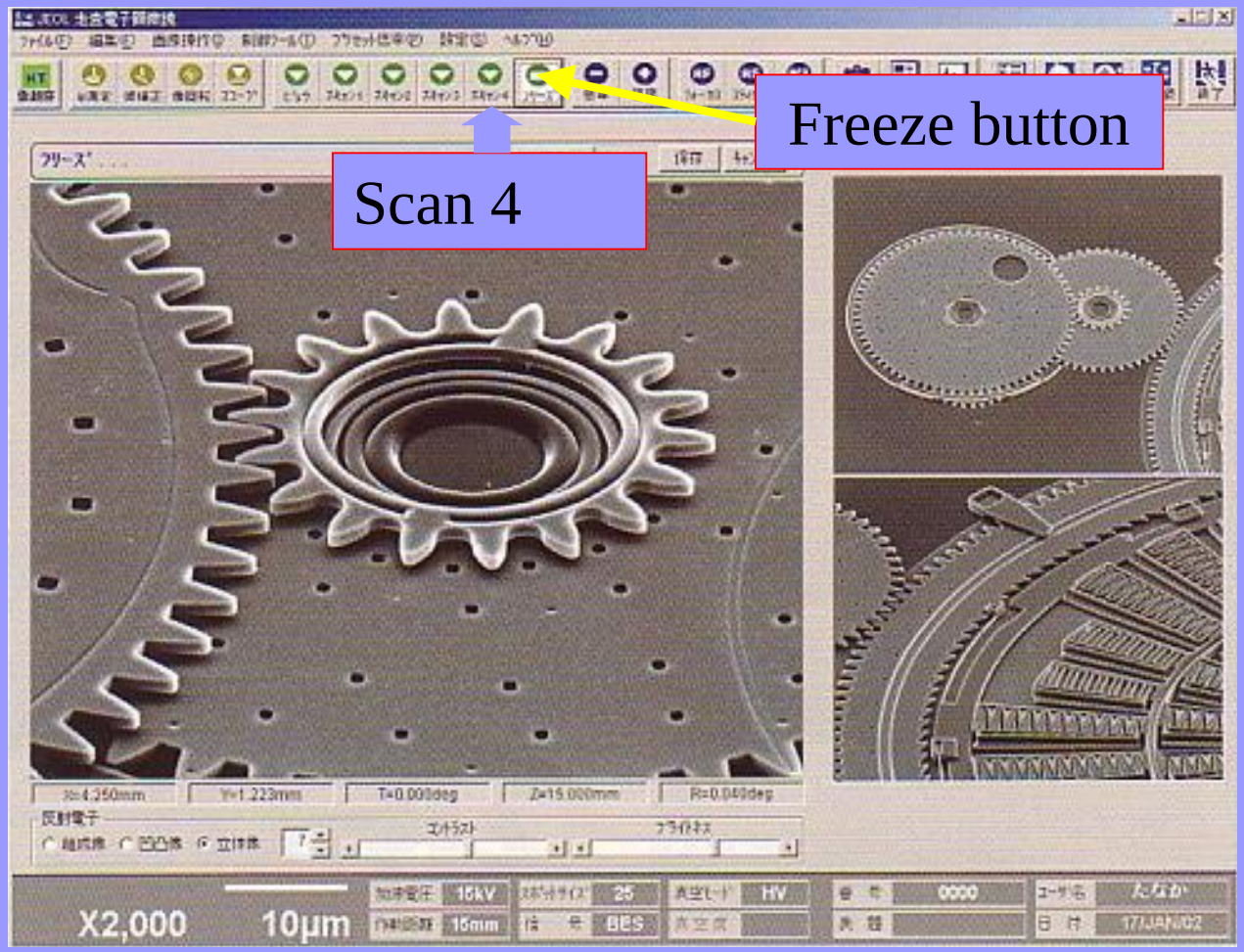
W Capture Box (Sub function)

Hitachi can store not only image but also image condition.

(Accelerating voltage, magnification, working distance, and so on)

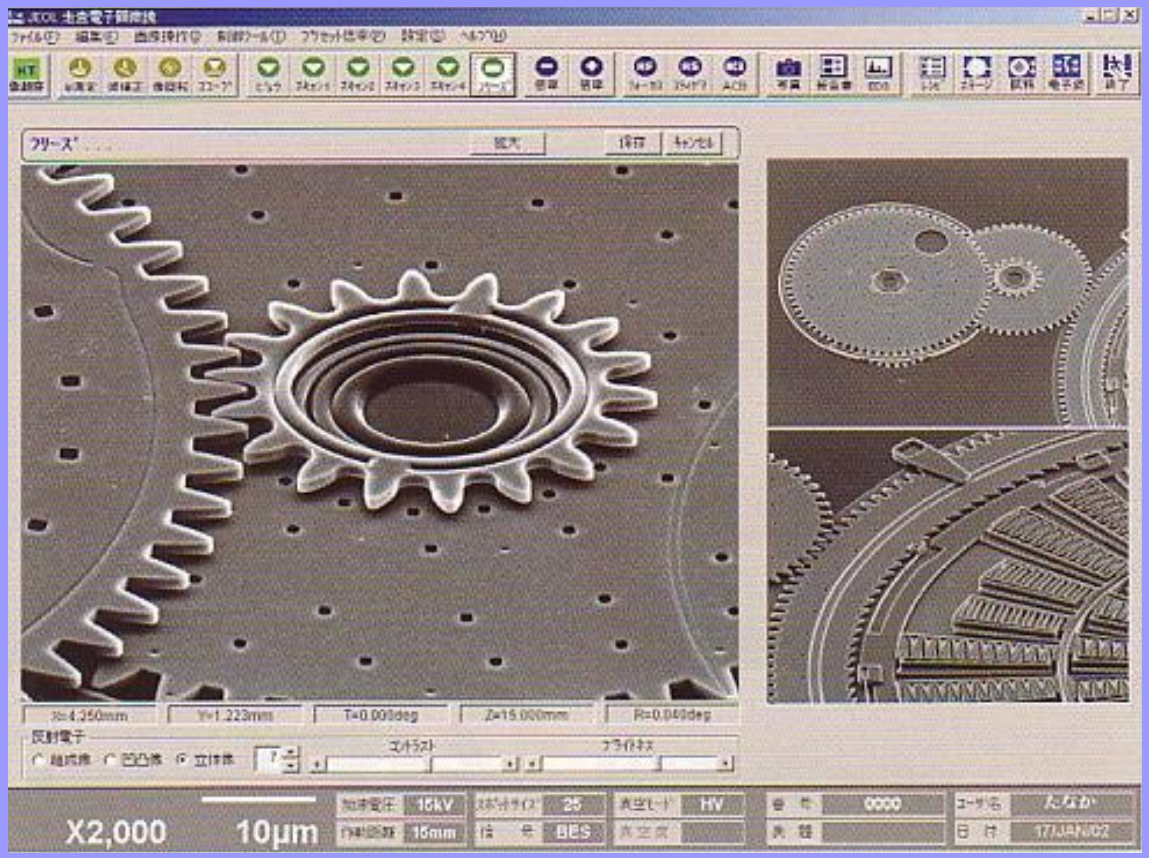
Anytime, you can go back the conditions.





JEOL's JSM-6xxx series

Image can be captured at only "Scan 4", slow scan mode on JEOL.



JEOL’s JSM-6xxx series

No Captured box.

Operator must save image and input image name every time.

It’s troublesome !

4-segment Semiconductor type BSE Detector

W 4-segment Semiconductor type BSE Detector

Hitachi adopt 4-segment “INDIPENDENT” semiconductor Type

It can make integrated image with 4 types image from 4 directions.

It can make image as 3D, Composition, Topographic.

JEOL’s BSE is 2-segment type. It is not useful.

Image A

Image C

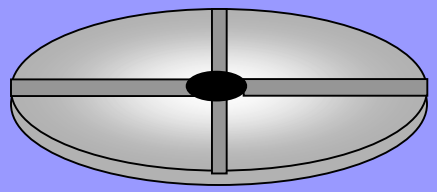
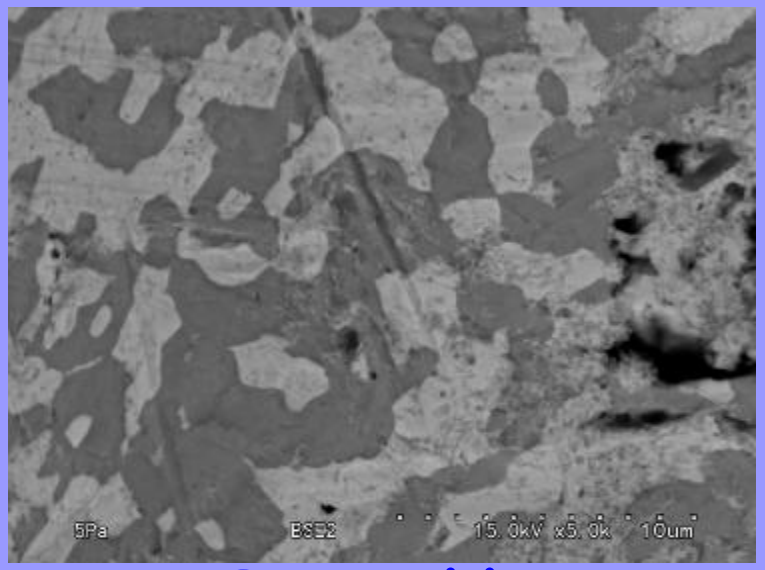
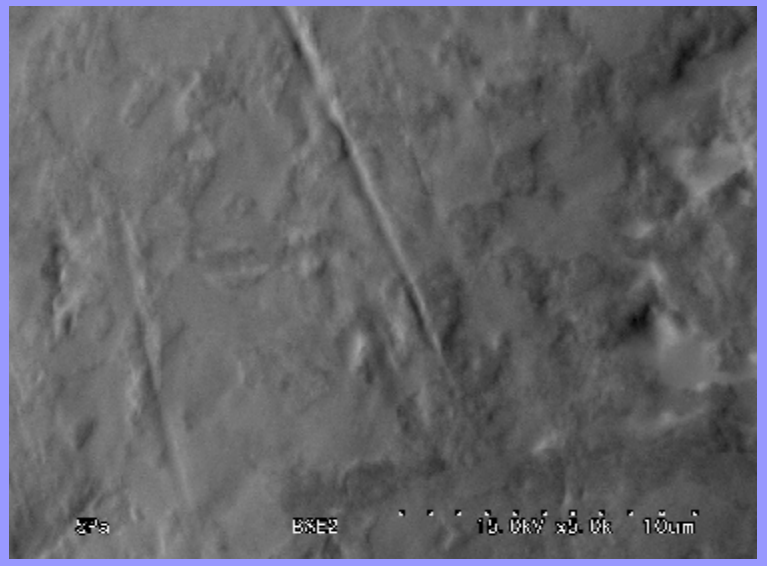


Image B

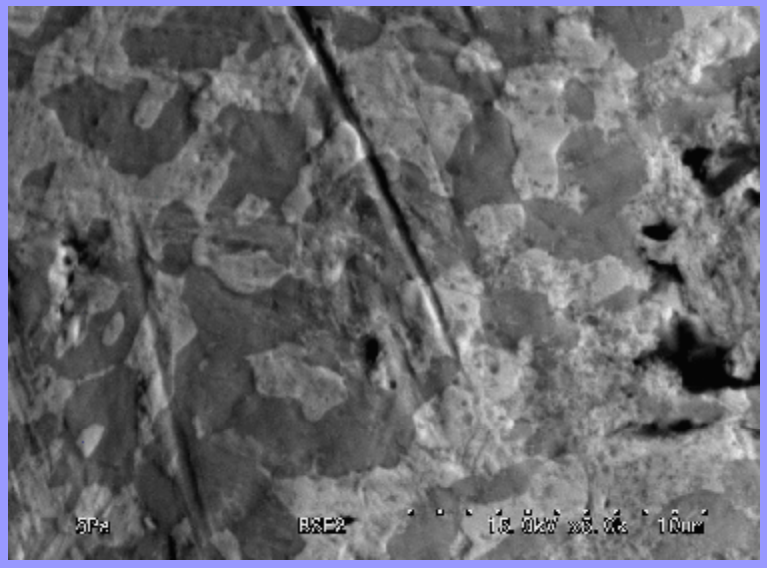
Image D



Composition



Topographic



3D

Sample : Copper
Vacc. : 15kV
Mag. : x5,000

Dual Bias function

High contrast imaging at low accelerating voltage

W Dual Bias function

Advantage of Observation at Low Accelerating voltage

1) Fine observation at sample surface image

2) Less sample damage

3) Efficiency for EDX Analysis of light elements

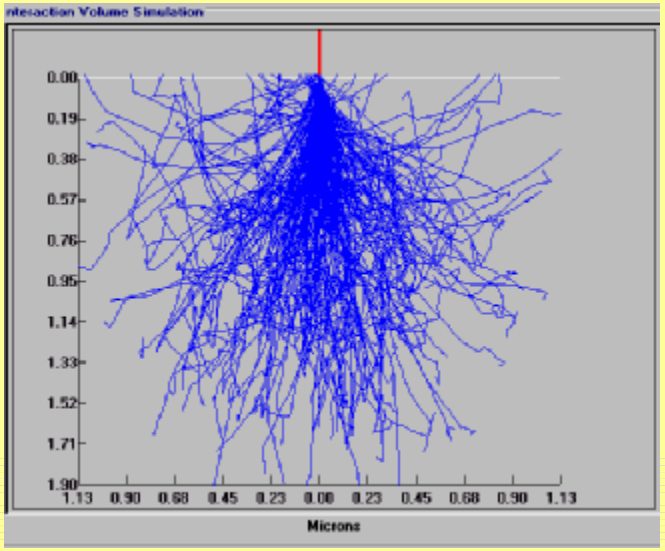
S-3500N and S-3600N guarantee 30nm at 3kV Low Vacc. Mode

JEOL does not guarantee it at such a condition.

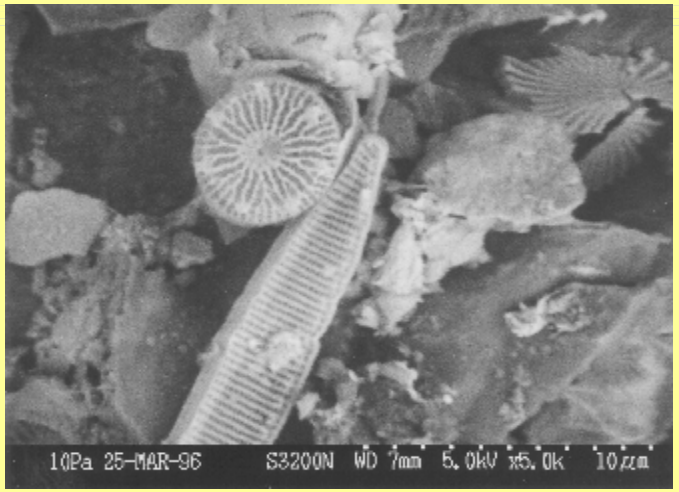
W Advantage of Observation at Low Accelerating voltage

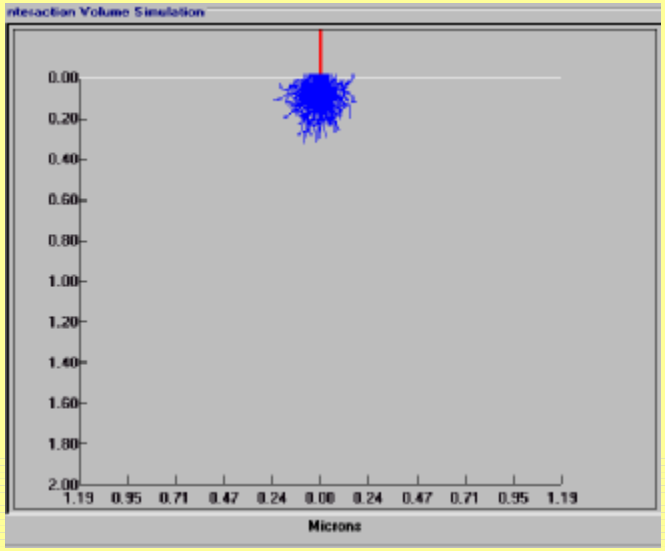
Diatom 15kV

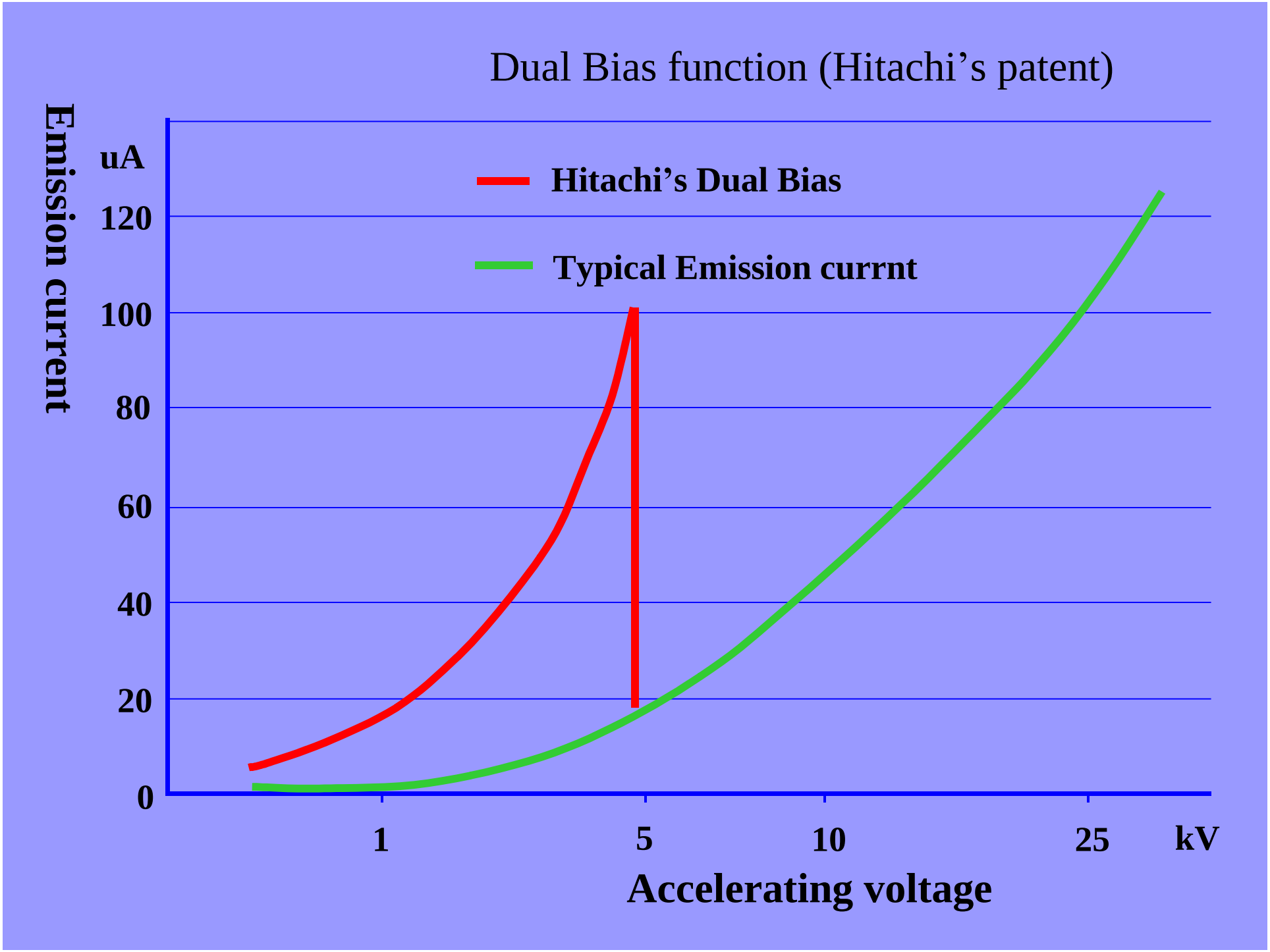




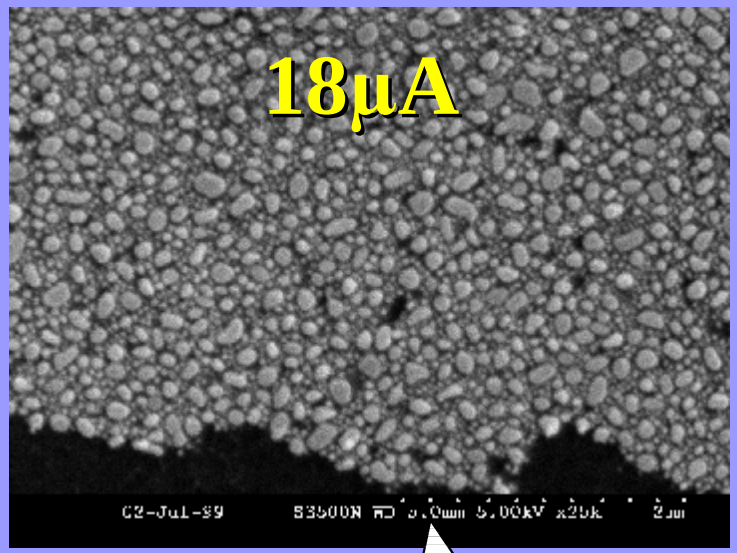
5kV



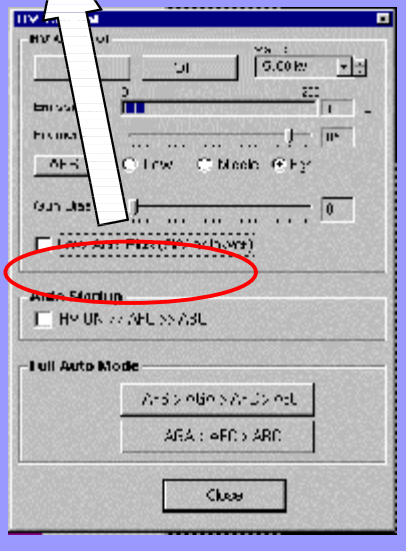


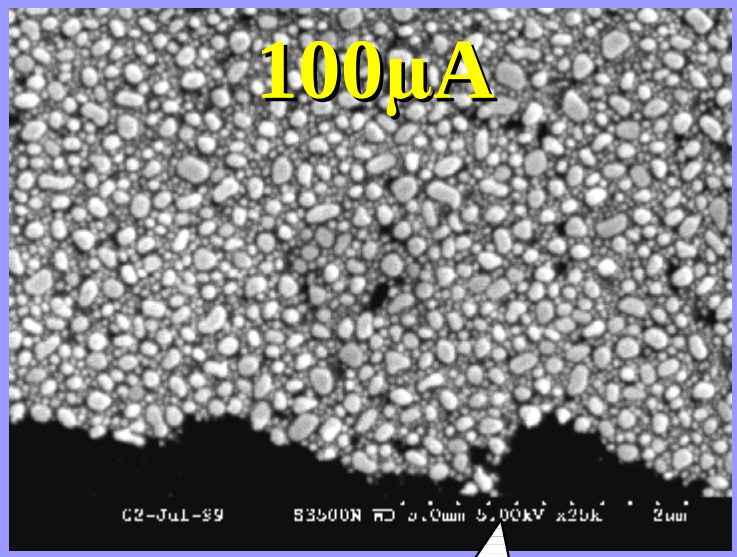

Dual Bias function (Hitachi's patent)
Emission current
uA
120
100
80
60
40
20
0
Hitachi's Dual Bias
Typical Emission currnt
1
5
10
25
kV
Accelerating voltage

Comparison of image brightness at Vacc. 5kV

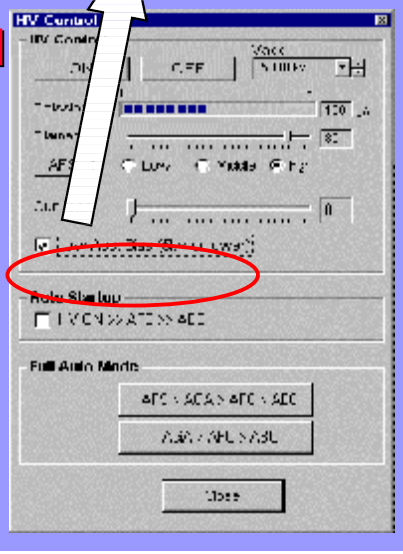


Dual bias OFF





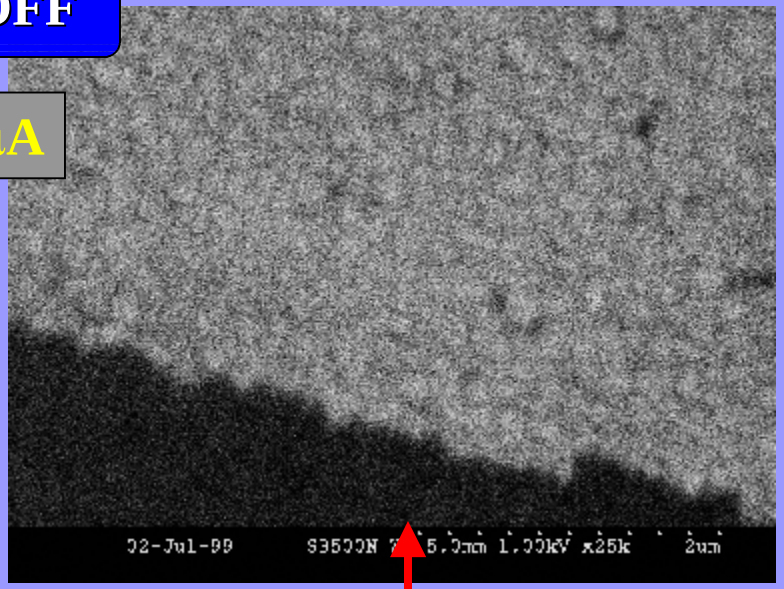
Dual bias ON



Vacc 1kV

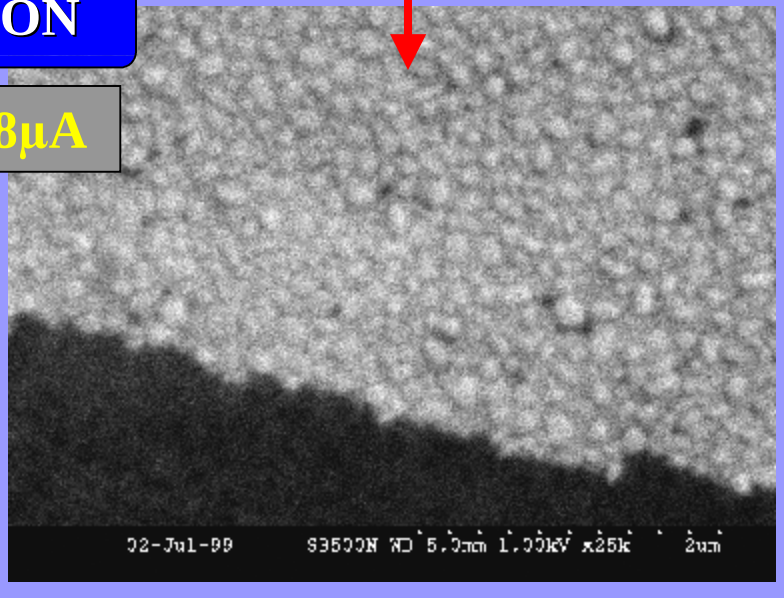
OFF

1μA



ON

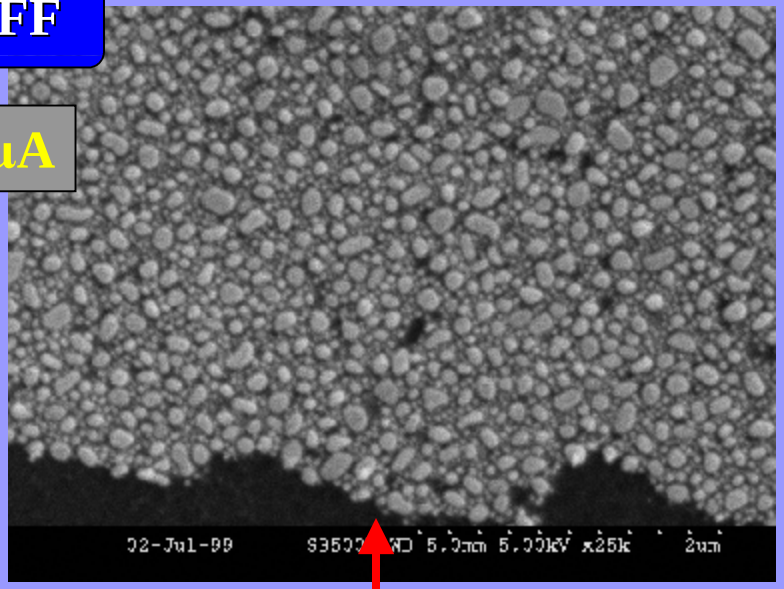
18μA



Vacc 5kV

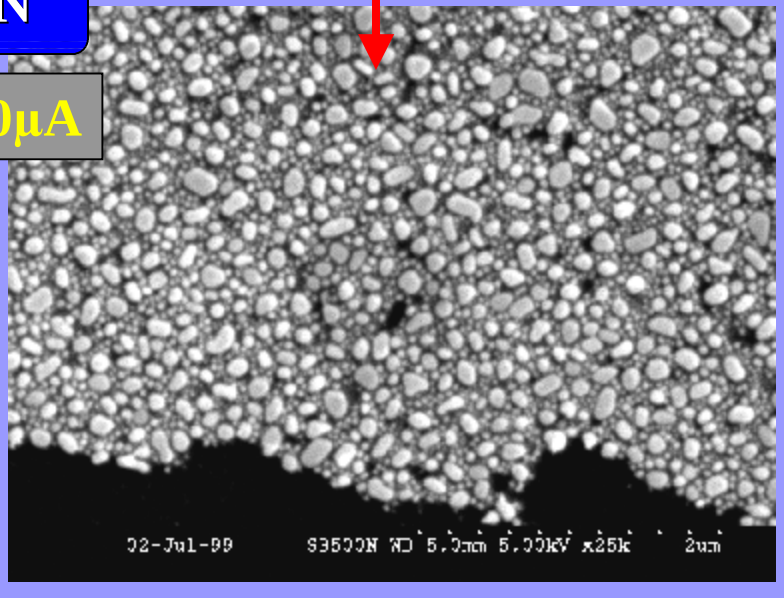
OFF

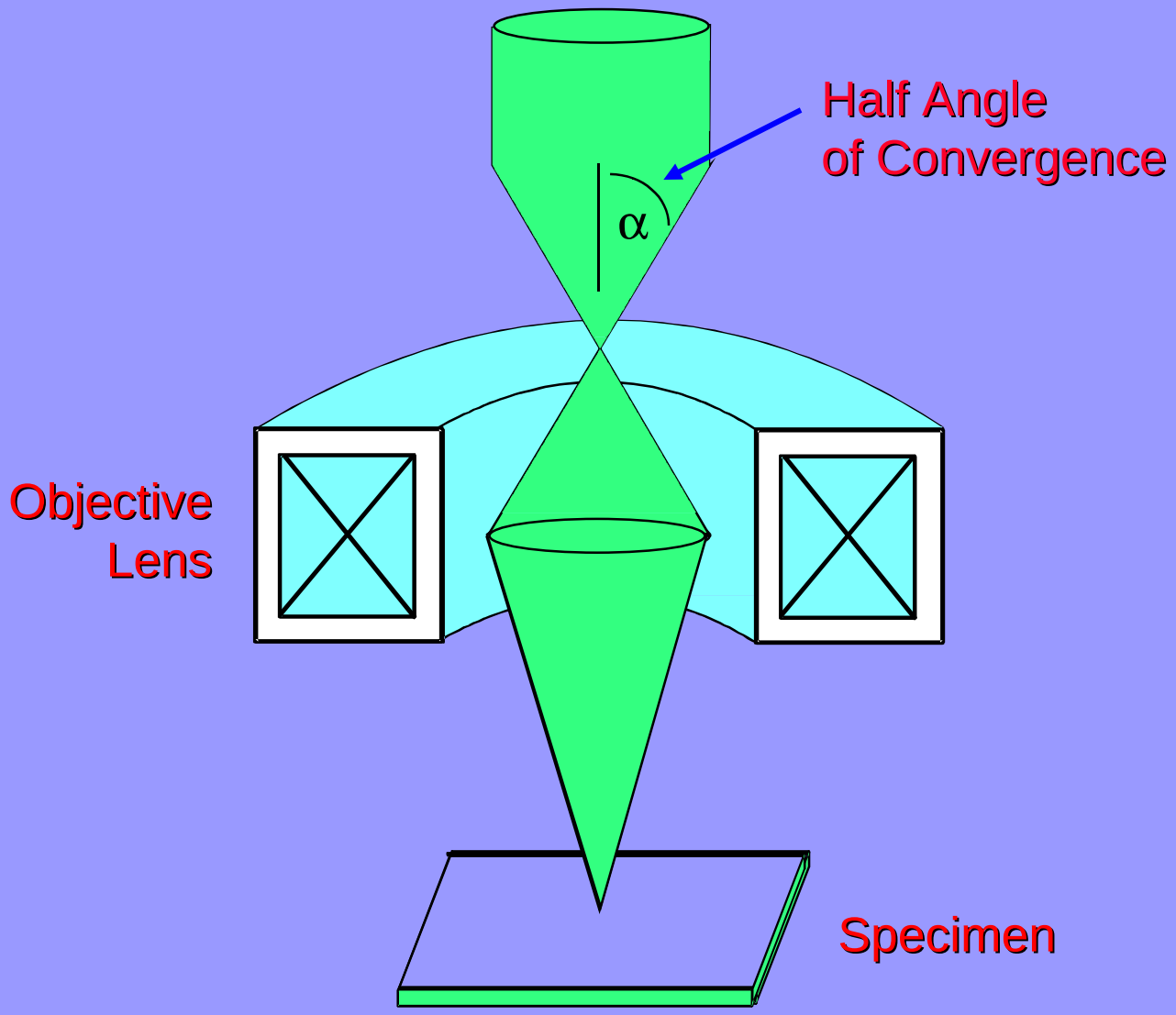
18μA



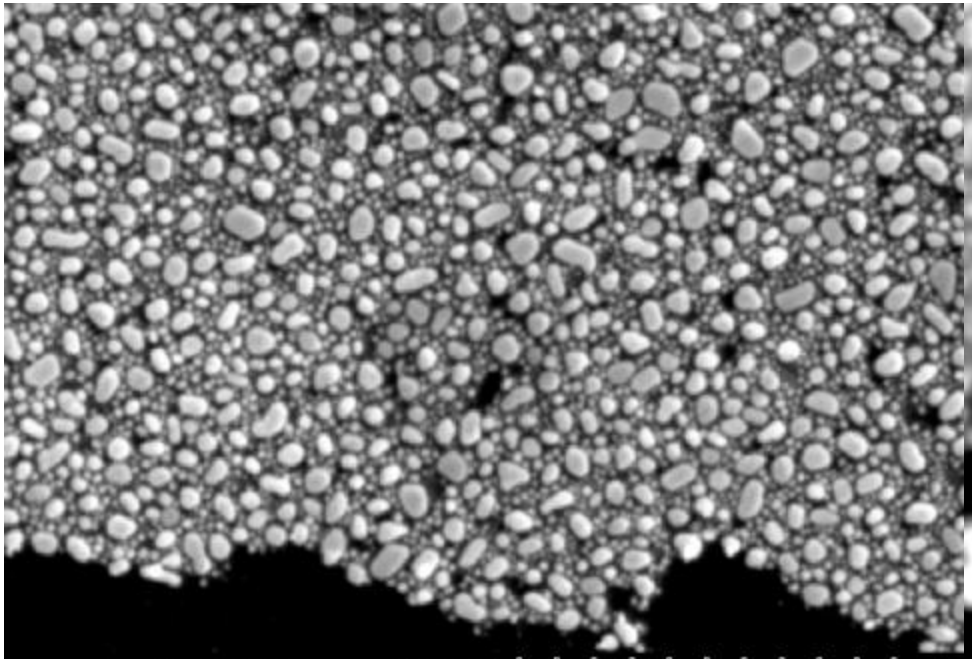
ON

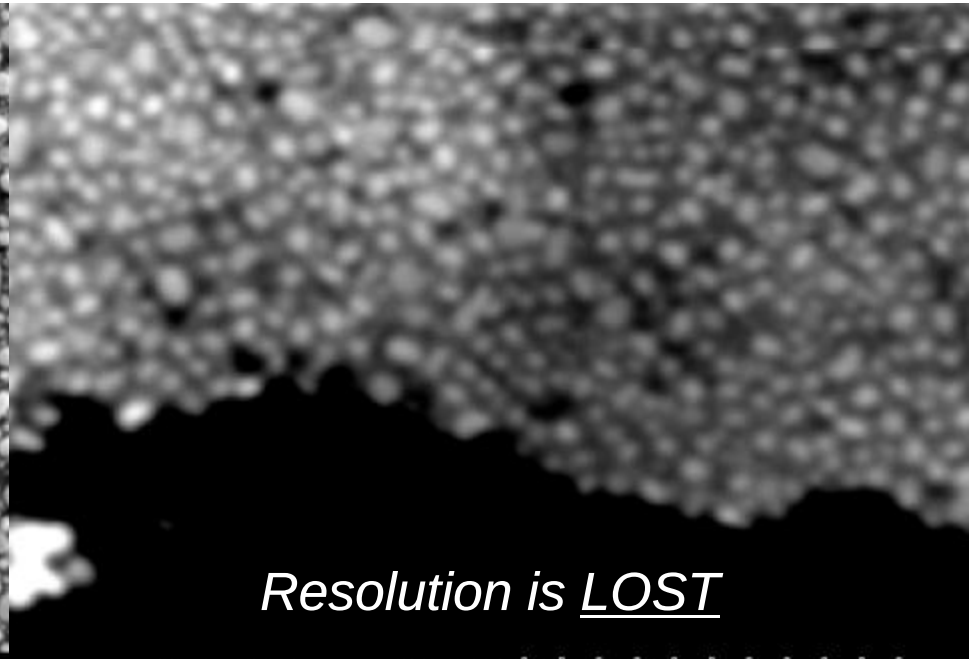
100μA

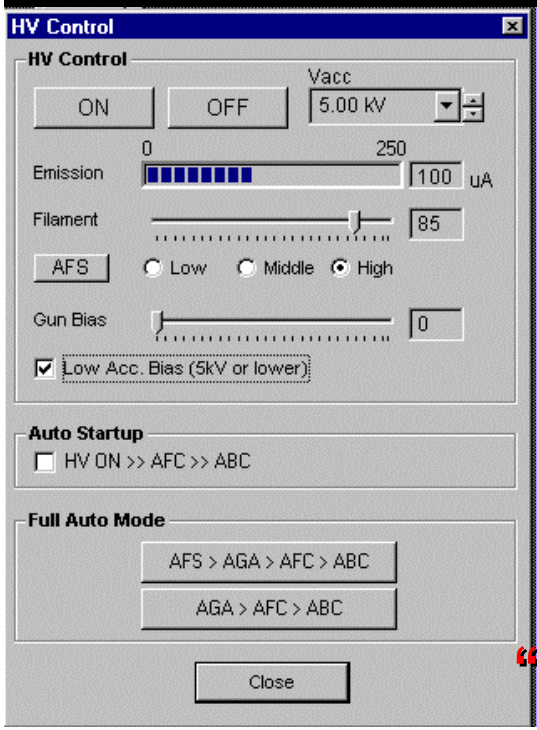




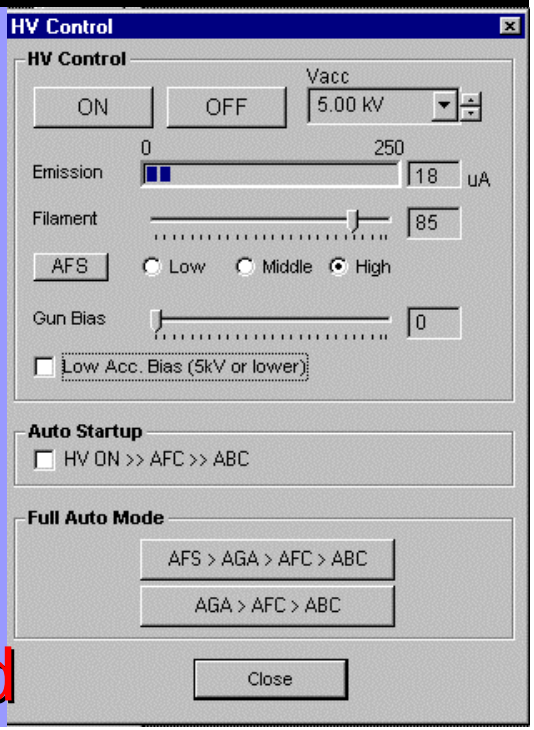
JEOL's ZOOM CONDENSER LENS SYSTEM







Similar Specimen Current obtained by "Zoom Condenser" Method



3D CG Maintenance guide

Liner tube system

Easy and Friendly “Maintenance assist function”

W 3D CG Maintenance guide

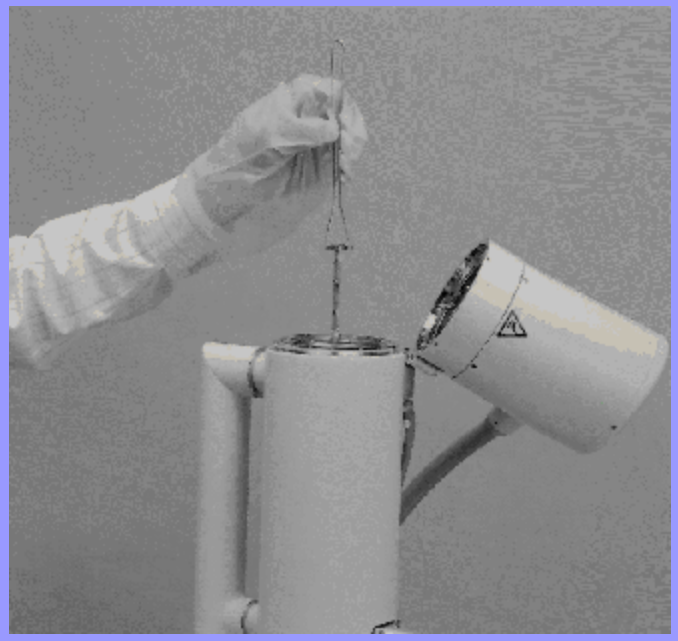


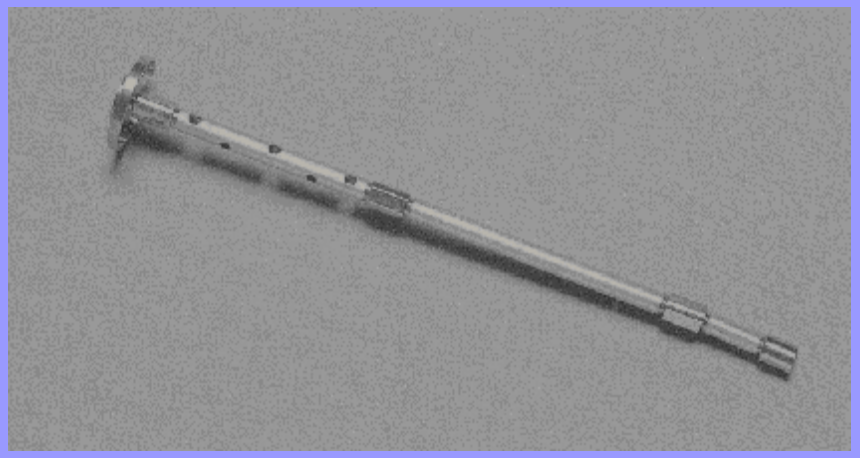


W Exchange of Condenser lens aperture

Liner tube system (Hitachi's patent)

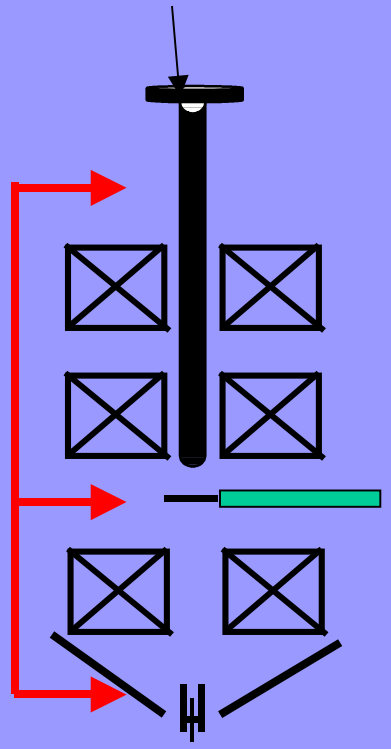
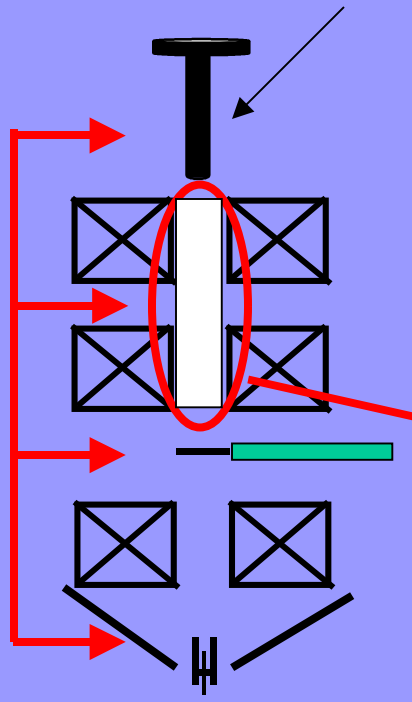
Aperture can be exchanged easily by customer without any disassemble



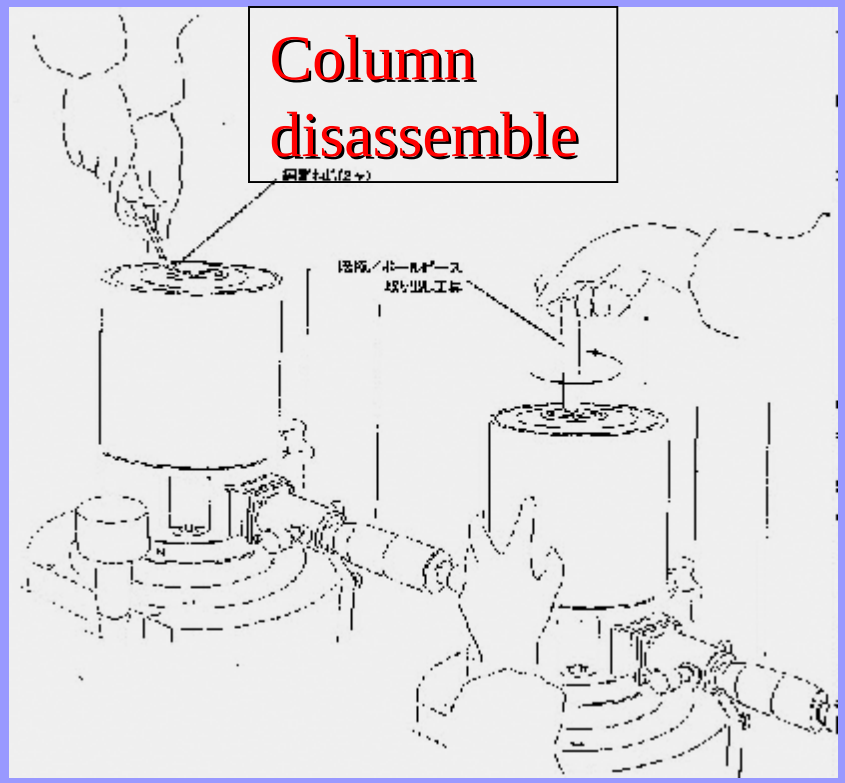


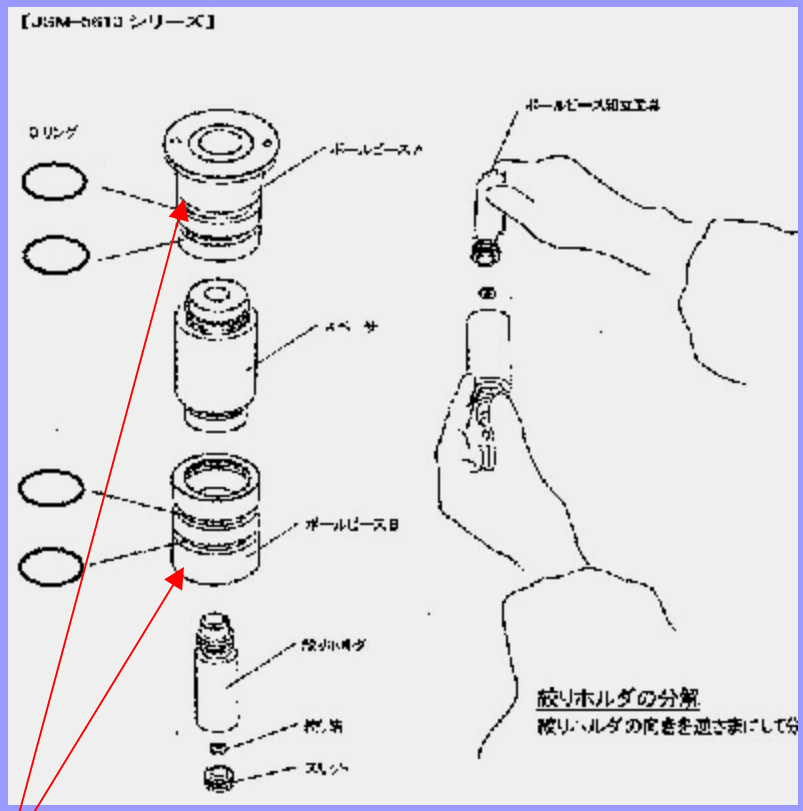
Liner tube

Liner Tube

	Hitachi	JEOL
• 1st condenser lens • 2nd condenser lens • Obj. lens moveable aperture • Objective lens • Obj. lens fixed aperture	Liner tube 	JEOL may mention this is liner tube.  NEED Cleaning Need disassemble by serviceman

JEOL's Instruction manual for their own serviceman





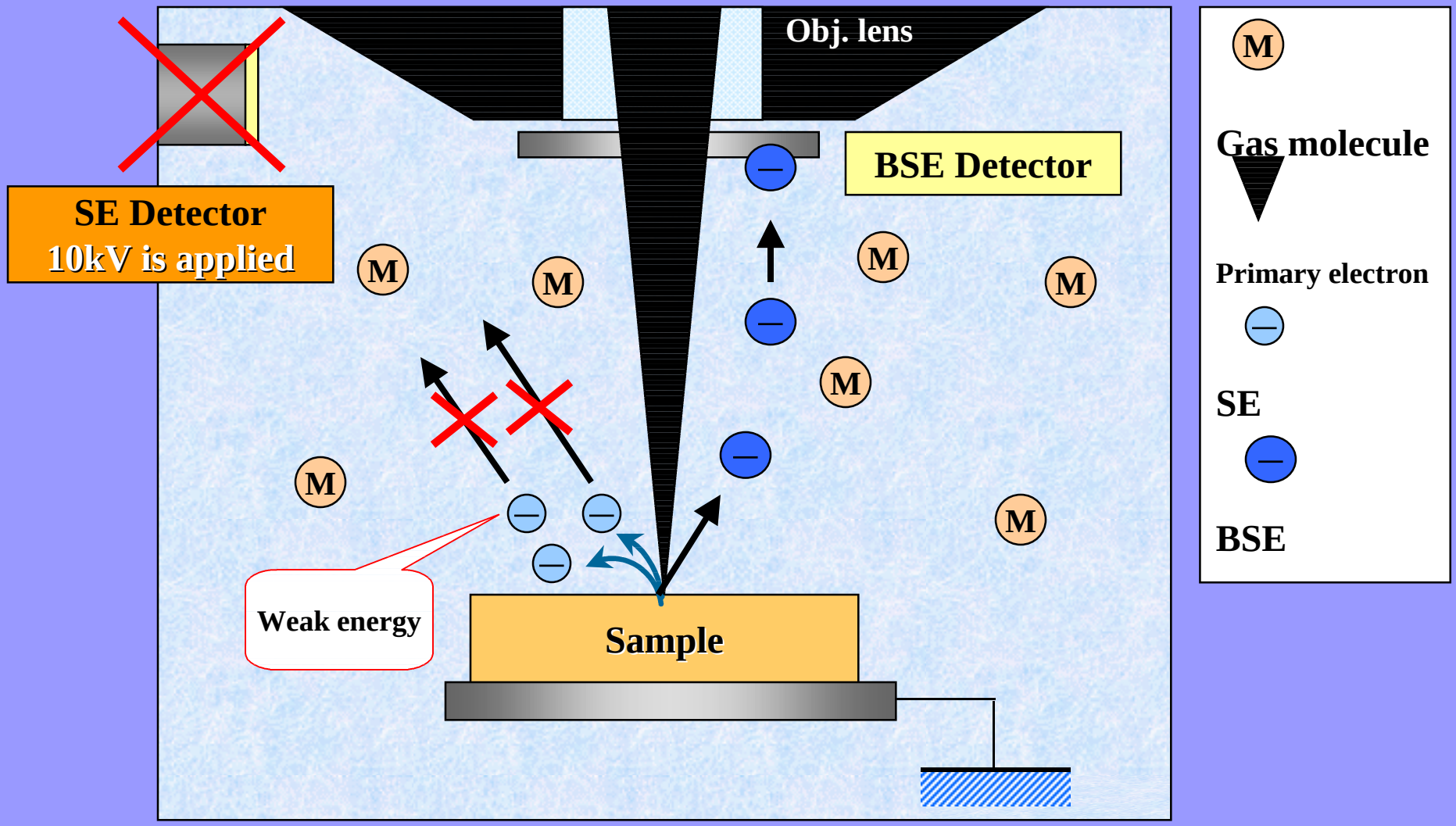
Lens

Disassemble should entail worn-out of SEM.

ESED

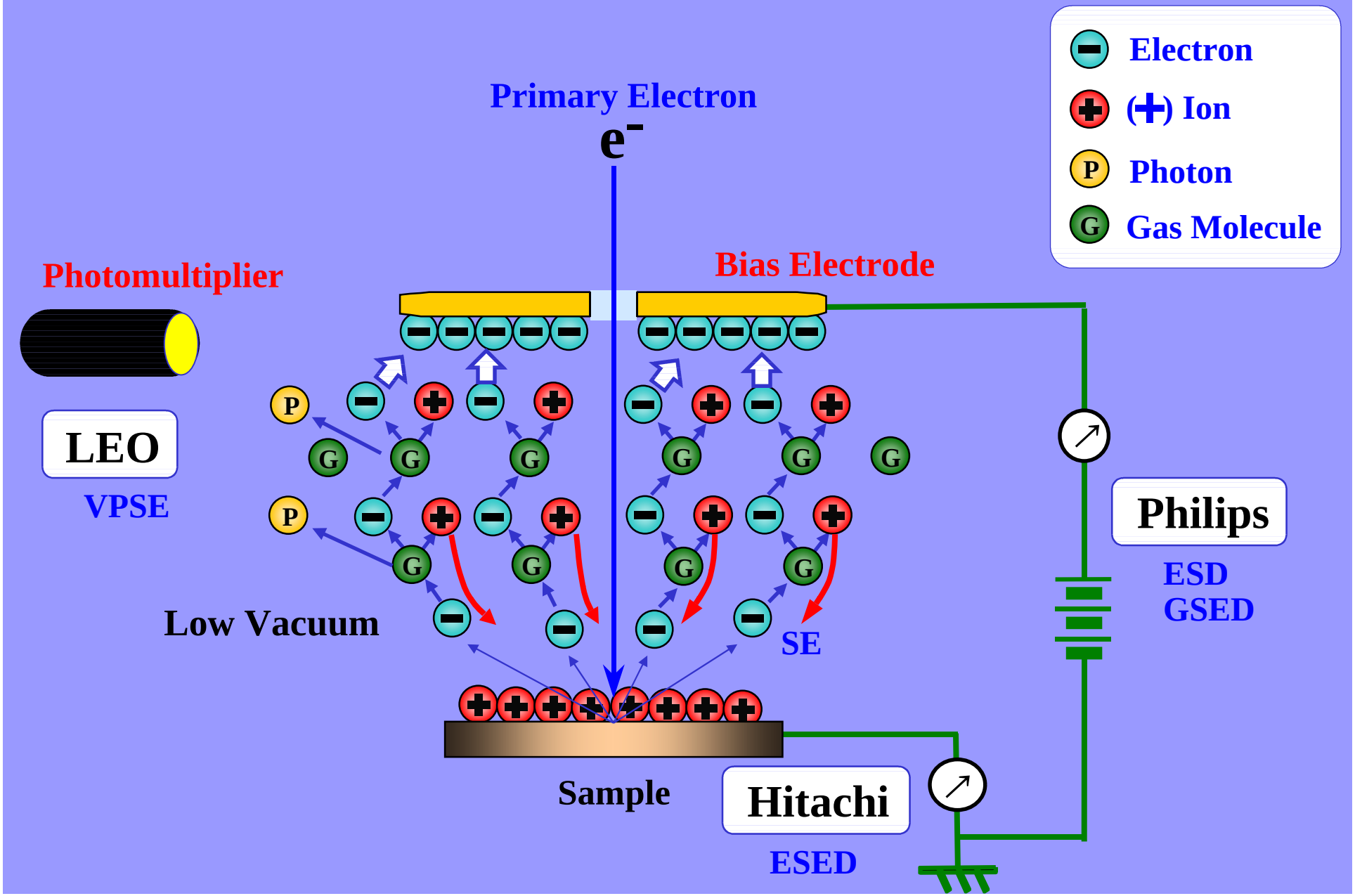
Environmental Secondary Electron Detector

Reason why SE can't be detected under VP mode



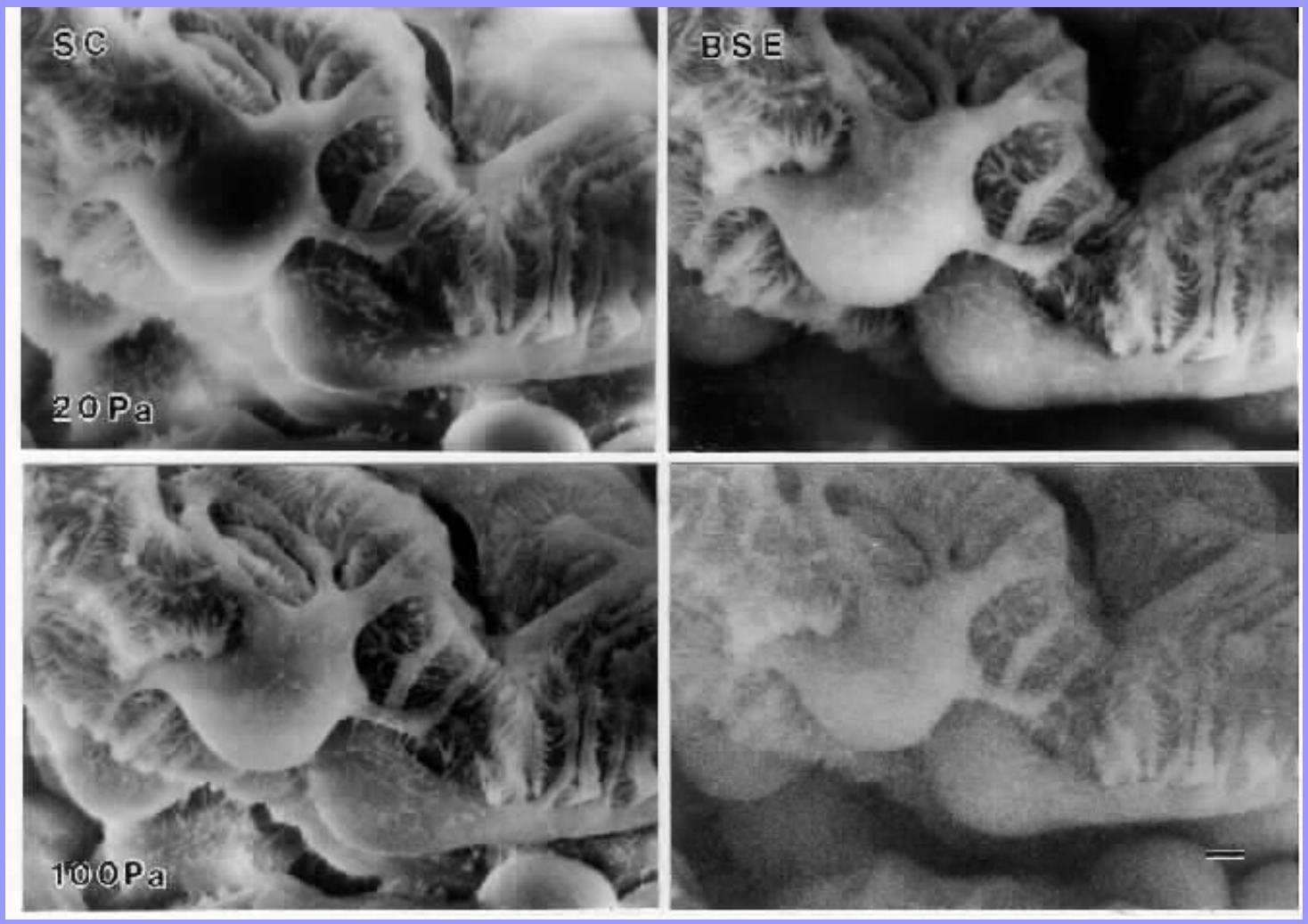
In SEM Chamber

Theory of SE Detection at Low Vacuum



Comparison of Detector in VP-mode

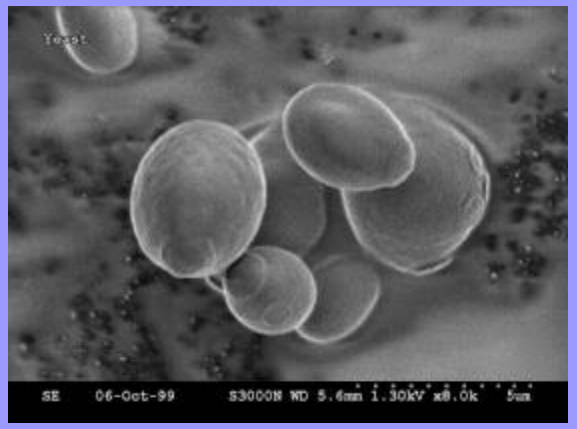
ESED **Robinson-BSED**



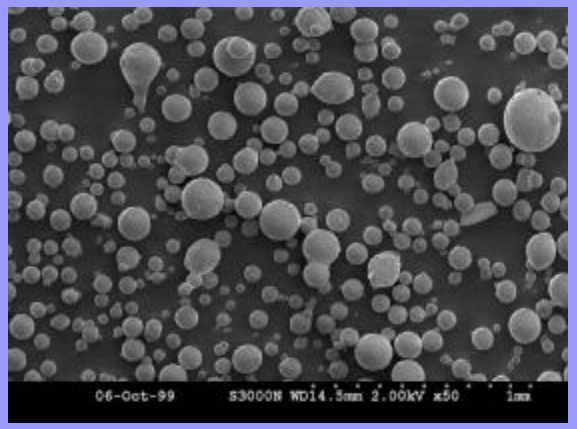
20Pa

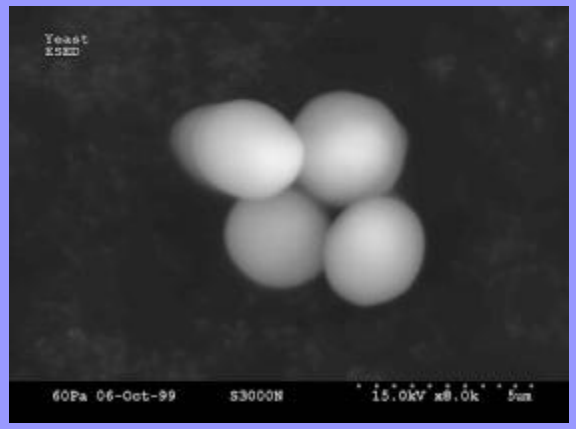
100Pa

Difference between Low/High kV

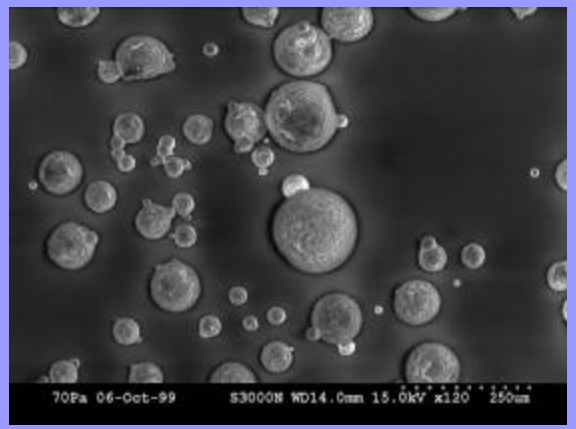


Low Voltage

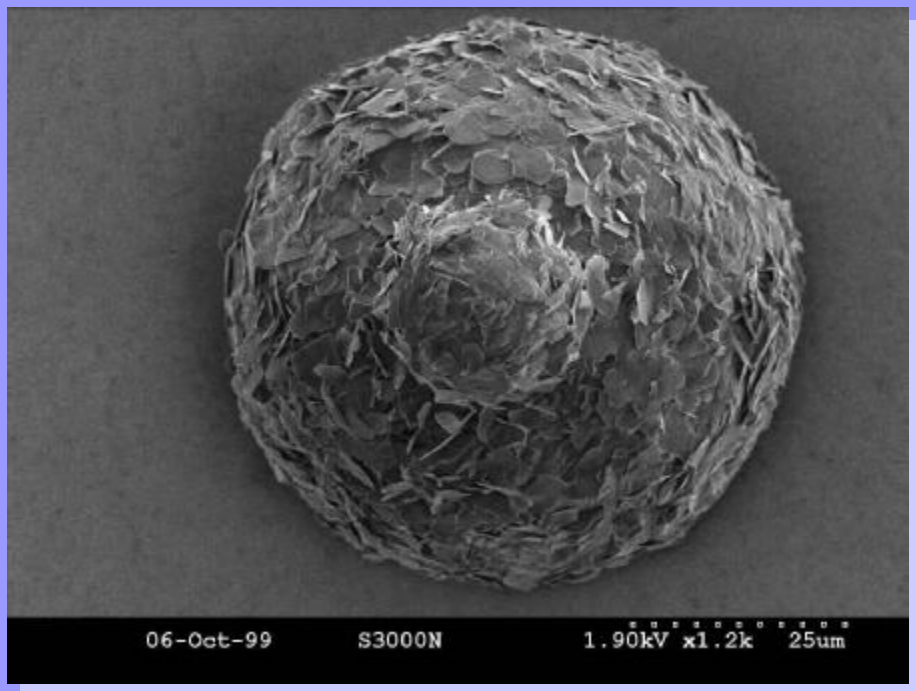


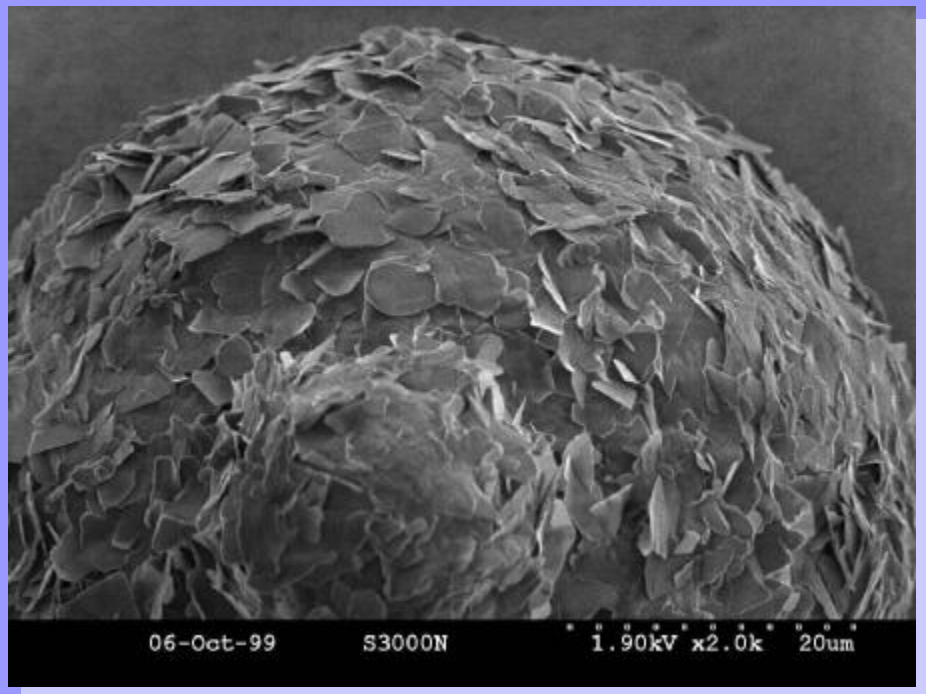


High Voltage



Advantage of Low Voltage

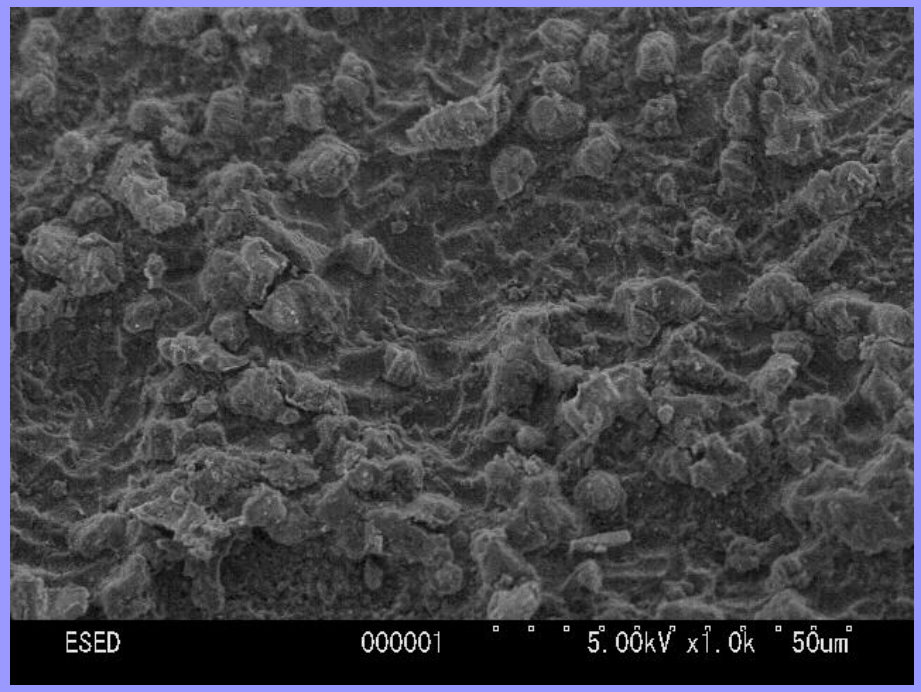




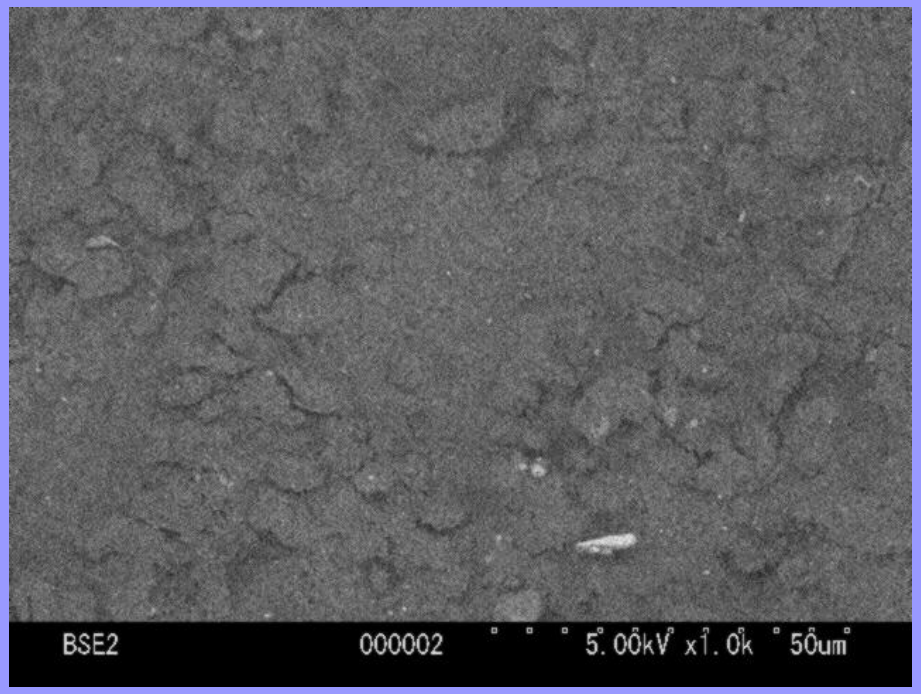
Encapsulated Fat Particles

These Images not Obtainable with GSED Because of the High Voltage and High Beam Current Required Destroys the Platelets

Comparison between BSE and ESED



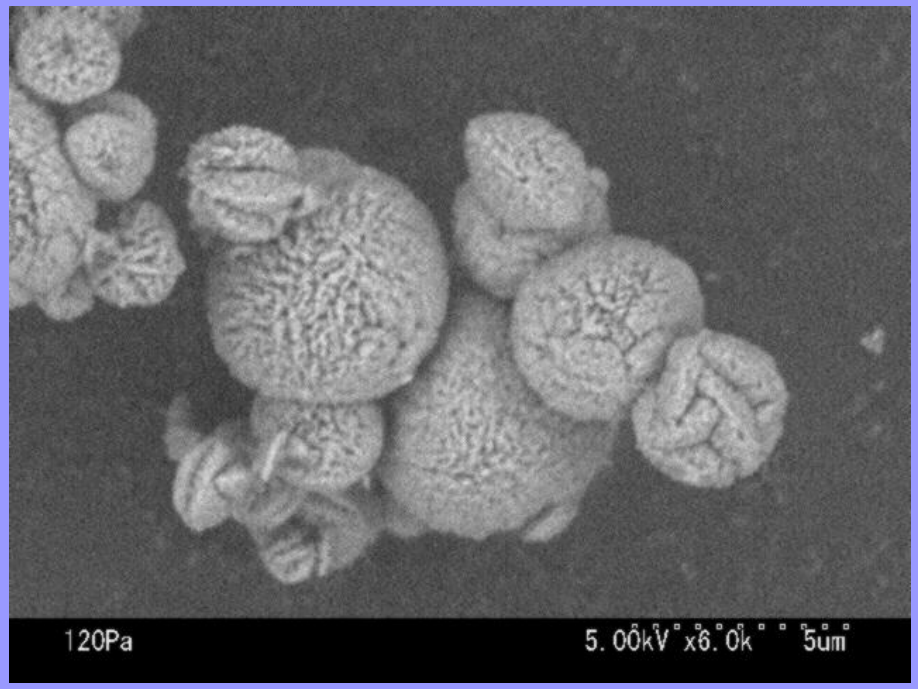
ESED Image
(HV : 5 kV)



BSE Image
(HV : 5 kV)

Surface of Rubber Roller

Comparison between BSE and ESED



ESED Image
(HV : 5 kV)



BSE Image
(HV : 15 kV)

Calcium Carbonate

Thank you