

# SEM-SCANNING ELECTRON MICROSCOPY FACILITY



**COMPANY MODEL:** JEOL JSM -7401f FESEM

**INSTALLATION PLACE:** Microscopy Laboratory (room No19-new building), Institute of Microelectronics

## **DESCRIPTION:**

The JSM-7401f ultra high resolution (1.5nm at 1kV) Field Emission Scanning Electron Microscope (FESEM) employs a cold conical gun and a conical highly excited magnetic field objective lens with low aberration, which in combination with new technologies (gentle beam method-GB and r-filter) enable the acquisition of high quality/resolution images even at low voltages.

## **SPECIFICATIONS**

1. Resolution: 1.0nm (15kV), 1.5nm (1kV), Magnification:  $\times 25$  to  $\times 1,000,000$
2. Accelerating Voltage: 0.1 to 30 kV, Probe Current:  $10^{-13}$  to  $2 \times 10^{-9}$  A
3. Electron Gun: Cold field emission electron gun (Tungsten single crystal emitter)
4. Objective lens: Strongly excited low aberration conical lens
5. Electron Detectors (three)+Camera: Upper secondary electron in-lens detector (SEI), Lower secondary electron detector (LEI), Retractable backscattered electrons detector (RBEI), IR camera
6. R-Filter: Energy filter that enables the user to select secondary and backscattered electrons emitted from a specimen according to their energy level (specimen topology and composition information)
7. Specimen Chamber: For a 200mm diameter specimen
8. Specimen Exchange Chamber: Airlock type 150(dia.) $\times$ 10(H) mm specimen holder at max size
9. Specimen Stage: Eucentric goniometer stage. Computer controlled 3-axis: X-Y: 70 $\times$ 50mm, rotation R:360 $^\circ$  and manual handling of Z-axis: 1.5 up to 25mm and tilt from -5 $^\circ$  up to +70 $^\circ$
10. Specimen Holders: i) 12.5(dia.)  $\times$ 10(H) mm, ii) 26(dia.)  $\times$ 10(H) mm, iii) 3' and 4' wafer holders, iv) STEM holder
11. Image Process + OS: 2 and 4 divided display, Pseudo color, image processing function (Sharpen, Gaussian, Smooth, Laplacian etc.), Windows XP, Supported Image File Formats: BMP, JPEG, TIFF
12. Vacuum System: i) 3 sputter ion pump units for  $P_{\text{gun}} \sim 10^{-8}$ Pa, ii) DP-DP series system and fore-line trap for  $P_{\text{specimen chamber}} \sim 10^{-5}$ Pa, iii) one oil rotary pump.

## **APPLICATIONS**

1. Besides the conventional SEM operation, the low voltage operation of this FESEM enables the study of the surfaces of a large variety of non-conductive specimens, with nanometer scale resolution, without the need for conductive coatings. Specimens for which expertise is being offered to the users of the facility include, among others: metals, ceramics, plastics, polymers, oxides for applications in catalysts, fuel cells, semiconducting devices etc. Surface features and particles from the nanometer to the millimeter scale are regularly being observed.
2. Observation Methods: *Standard SEM*, *R-Filter mode*: for surface morphology (secondary electrons), compositional mapping (backscattered electrons) or superposition of both signals; helps in the reduction of the effects of charge built-up, *Gentle Beam (GB) mode* (electron deceleration near the specimen): for surface observation, reduction of charge built-up and high resolution at very low voltages. *Scanning Transmission Electron Microscopy (STEM)*.

## **CERTIFICATION/ACCREDITATION**

The facility is not certified or accredited.

## **CONTACT PERSONS**

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