

SCANNING ELECTRON MICROSCOPY (SEM) FACILITY



COMPANY MODEL: JEOL JSM -7401f FESEM

INSTALLATION PLACE: Microscopy Laboratory (room No19-new building), Department 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.

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 2×10^{-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 (SEI), Lower secondary electron (LEI), Retractable backscattered electrons detectors (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 (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
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. Conventional SEM operation and the low voltage operation of this FESEM to study surfaces of a large variety of non-conductive specimens, with nanometer scale resolution. Materials: metals, ceramics, plastics, polymers, oxides, semiconductors and semiconducting devices. 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: services@imel.demokritos.gr