

Electron Microscope Facilities at Institute of Physics

Microscope ??

Microscopes with Lenses

1. Optical Microscopes
2. Electron Microscopes
3. X-ray Microscopes

Microscopes without Lenses

1. Field Ion Microscopes
2. Point Projection Microscopes
3. Scanning Probe Microscopes

**Electron
Microscope**

Important
parameter λ

$$R = 0.61 \lambda / \mu \sin \alpha$$

Electron Microscope ?

Resolution for OM \approx 200 nm (max)
Resolution for EM depends on Electron energy

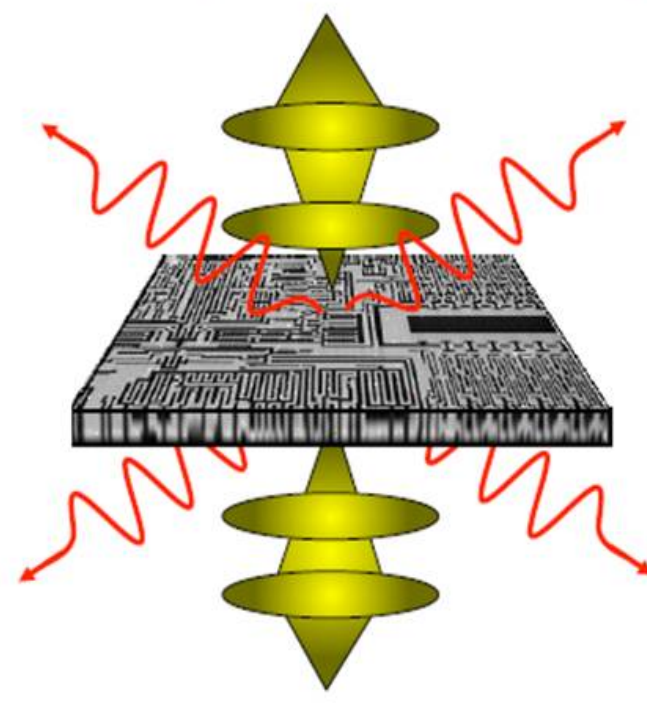
Electrons?

1. Wave - particle duality in nature
2. Penetration Depth and Interaction Volume small enough to allow diffraction from individual grains (very small volume)

Incident electron energy
typically 0.2 - 40 keV

Scanning EM

Deals Mainly with Near Surface Region



Transmission EM

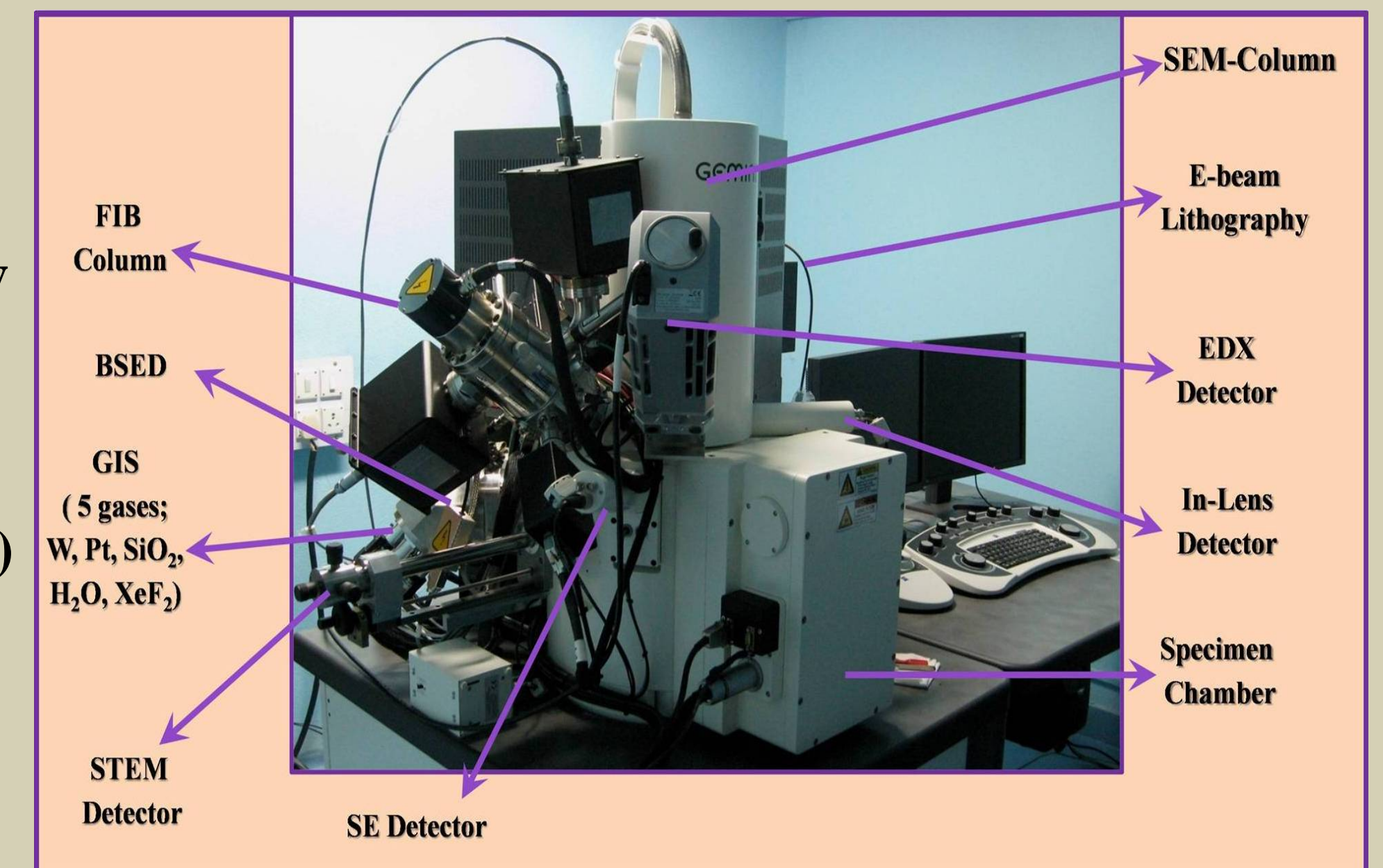
Deals Mainly with Internal Structure

Incident electron energy
typically 100 - 300 keV

Facilities

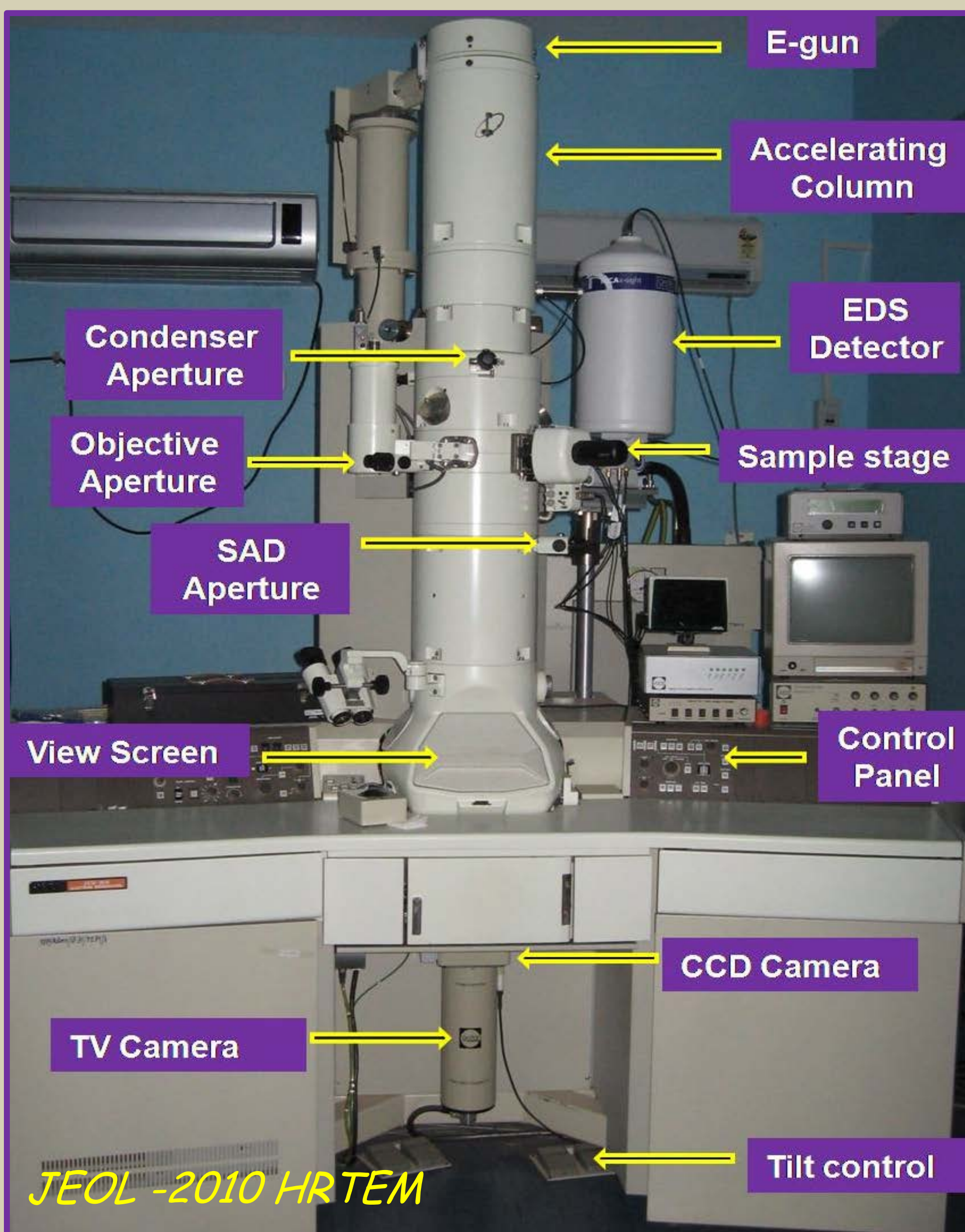
- ❖ Ultra High Resolution Transmission Electron Microscope (with URP Pole Piece, Resolution: 0.19 nm) (Attachments: High temperature specimen stage: RT to 1000 C; Low temperature specimen stage: LN₂ to RT [website: www.iopb.res.in/~tem_iopb](http://www.iopb.res.in/~tem_iopb))
- ❖ Field Emission Gun Scanning Electron Microscope . Focused Ion Beam (FEGSEM-FIB) with Gas Injection System, Auto TEM specimen preparation, Raith Lithography and STEM
- ❖ Probe Station: In air.
- ❖ High vacuum coating unit
- ❖ Chemical Vapor Deposition Unit

SEM @ IOP



Neon 40 Crossbeam FEGSEM (M/S. Carl) Zeiss

TEM @ IOP



Energy : 200 kV

Point to Point Resolution : 0.194 nm

Source : LaB₆ Crystal

Condenser Aperture : 120,70,50,20,10 microns

Objective Aperture : 120,60,20,5 microns

SAD Aperture : 100,50,20,10 microns

Sample Stage : Five axis Goniometer
X,Y : \pm 1 mm Z: \pm 0.1 mm
Tilt: \pm 20°.

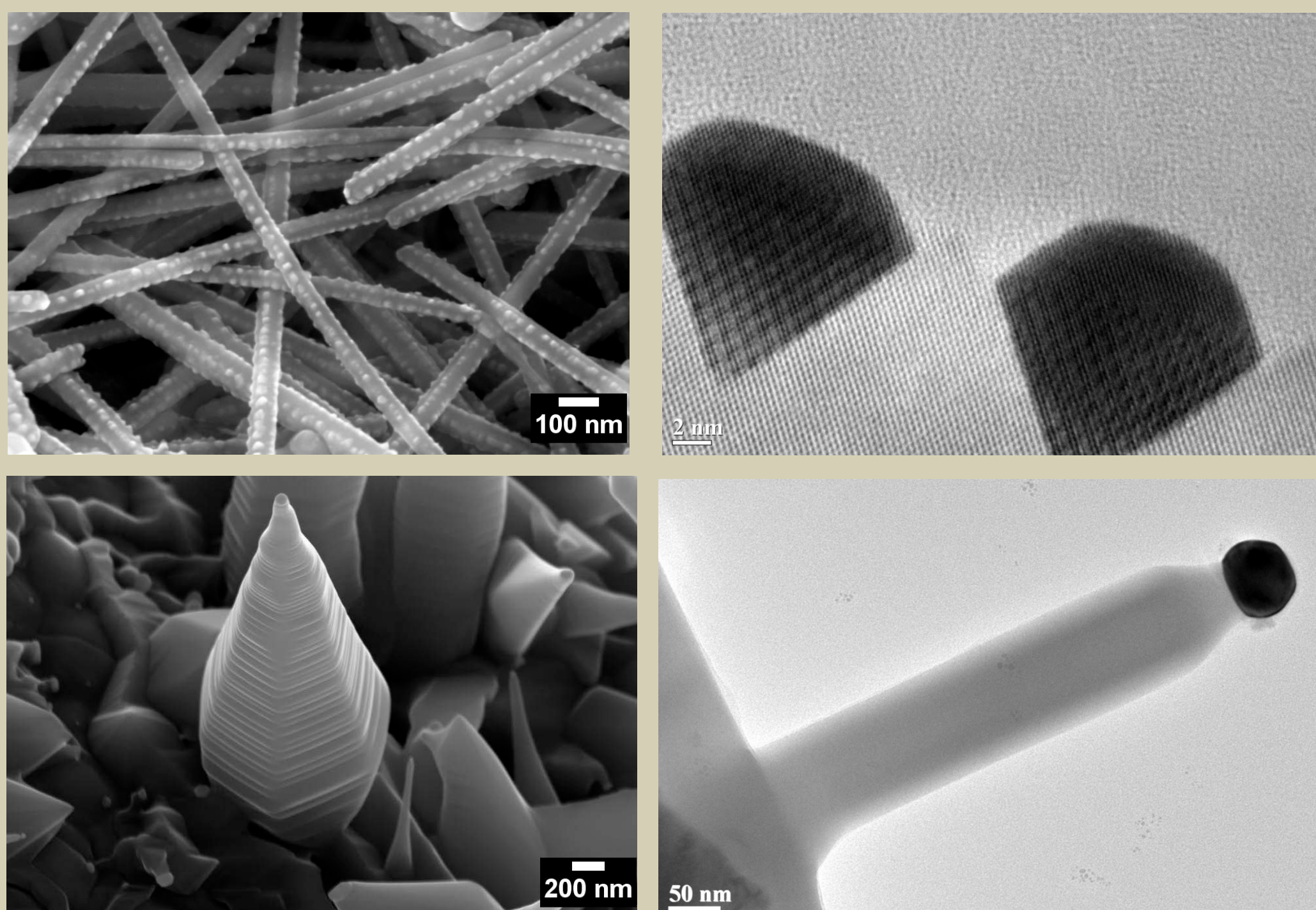
Viewing Screen : YAG Screen

CCD Camera

TEM Sample Preparation Unit



Recent Results



Deposition Systems

