







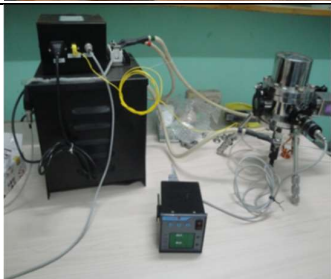






Thin Film Photovoltaic Lab
 School of Electronics Engineering
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Research Facility


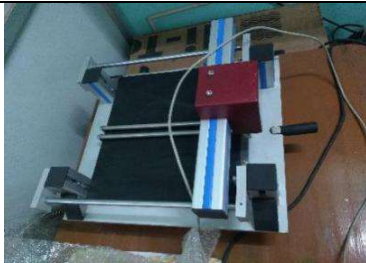

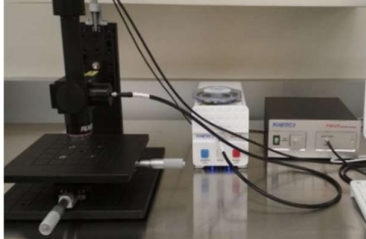
S.No.	Equipment Name	Model/Make	Picture	Specification	Funded by	Remarks
1.	Four source Co-evaporation System	Custom Designed M/s Excel Instruments		Effusion cell (Knudsen type). Max Temp. 1200°C Simultaneous deposition of 2 or more materials possible Substrate Rotation Substrate Heating	DST	Deposition of different metal and non-metals
2	DC/RF sputtering system	M/s Excel Instruments		Three gun with 3" target Substrate heating max 500 °C Fixed Substrate rotation	MNRE	Deposition of metal, alloys and oxide

3.	DC/RF Sputtering system	Advanced Process Technology, Pune		3 sputtering gun. 2 inch target Substrate rotation Substrate heating	MNRE	Deposition of metal, alloy and oxide
4.	X-ray Diffraction unit	Shimadzu XRD-6100		It consists of (2 kW, NF, Cu tube) Graphite monochromator (CM-3121) $2\theta=10^{\circ}-80^{\circ}$ $\lambda=1.45\text{\AA}$ Glancing angle $1^{\circ}, 2^{\circ}, 5^{\circ}$ and 10° possible	DST	Structural Characteristics
5.	UV-VIS spectrophotometer	Shimadzu UV-2450		Wavelength Range 300 nm to 900 nm. Measures absorbance, reflectance and transmittance.	MNRE	Optical Characteristics

6.	Hall Effect Measurement	HMS-3000 (Ecopia, Korea)		Measurement of carrier conc., mobility, resistivity and hall coefficient etc.) Properties of the film at room temperature or at liquid Nitrogen Temperature Sample size: 1cm×1cm	DRDO	Electrical Characterisation
7.	EDXRF/ MNRE	Shimadzu EDX-7000		Composition measurement (air and < 24°C) of the film, powder and liquid sample. Thickness of the film sample. Multilayer film Thickness measurement	MNRE	Elemental Identification Thickness Measurement
8.	RTP Furnace	RTP-1000D4 MTL, USA		Annealing in the vacuum or gaseous environment. Max. temperature 1000° C Ramp rate 50°C/sec possible For short duration, 120°C/Sec	DRDO	Surface Modification
	RTP Furnace	Custom Designed M/S Excel Instruments		Max Temp 500 °C Substrate Size Max. 1" x 1"	MNRE	Annealing in Vacuum/Ar or N ₂ atm

	Digital Furnace	Custom Designed		Max temp 800 °C Substrate Size 1" x 1"	DST	Annealing in air
	RTP furnace	Custom Designed M/S Excel Instruments		Max Temp 800 °C Substrate Size Max. 2" x 2"	MNRE	Annealing in Vacuum/Ar or N ₂ atm
	RTP Furnace	Custom Designed M/S Advanced Process Tech, Pune		Max Temp 1000 °C Substrate Size Max. 3" x 3"	MNRE	Annealing in Vacuum/Ar or N ₂ atm
9.	Current-voltage measurement setup	Keithley 2611 and 2614B		I-V measurement Maximum voltage range =-10V to 10 V Operating temperature 23°±5° C Humidity ≤70	MNRE/ DST	Device Characterization

10.	Impedance Analyzers/ LCR Meter	PSM 1700 Newtons4th		Frequency range 10 μ Hz to 1MHz	MNRE	Impedance Measurement/ Capacitance Measurement https://www.newtons4th.com/products/frequency-response-analyzers/psm1700/
	Impedance Analyzers/ LCR Meter	Agilent E4980A		Frequency range 20Hz to 2MHz	DRDO	Impedance Measurement/ Capacitance Measurement https://www.keysight.com/en/pd-715495-pn-E4980A/precision-lcr-meter-20-hz-to-2-mhz?&cc=IN&lc=eng
11.	Thermal Evaporation System with e-beam facility	Hind High Vac.		Substrate Heater	DST	Metal Deposition e-beam is out of order
12.	Spin Coating System/DST	Apex Instruments		Range: 100 -10,000 RPM Substrate Heating 70°C	DS T	Thin film Deposition

13.	Ball Milling	Fritsch P6		Jar and Ball :ZrO ₂ Capacity up to 225 ml rotational speed of the main disk – up to 650 rpm	DST	Mixing of Precursor Powders Particle size reduction https://www.fritsch-international.com/sample-preparation/milling/planetary-mills/details/product/pulverisette-6-classic-line/
14	Glass Cutter			Min size 1 cm x 1cm	DST	
14.	Spray Pyrolysis unit with Substrate heating arrangement	M/s Excel Instruments		Substrate Heating Substrate Size: 2” x2”	DST	Deposition of non-toxic materials by SP
15.	Thickness Measurement	F-10, Filmetrics, USA		Thickness range: 15nm-70µm Wavelength:380- 1050nm	DRDO	Thickness Measurement https://www.filmetrics.com/thickness-measurement/f10-rt

16.	Fume Hood	Custom Designed					Chemical Bath Deposition, etc
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Note: We are open for any collaborative work

