

Indian Institute of Space Science and Technology

Thiruvananthapuram



Details of Instructional and Research labs
under the
Department of Chemistry

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1 Inorganic Chemistry Lab

- **Floor Area:** 75 sq m
- **Overall capital expenditure:** 70 Lakhs
- **Major instruments/ equipments:** Vacuum Oven, Heating Oven, Ultra Sonication Unit, Freezer, Hot plate, Drier, Centrifuge machine
- **Objective of the lab:** This lab is aimed for synthesis and processing of various materials and is ably equipped for the same. Synthesis and processing of various materials, such as quantum dots, metal nanoclusters, new polymers, composites, smart materials, high-temperature materials, energy storage materials etc. can be conducted.



Figure 1: Inorganic Chemistry Lab.

2 General Chemistry Lab

- **Floor Area:** 140 sq m
- **Overall capital expenditure:** 70 Lakhs
- **Objective of the lab:** General Chemistry Lab caters to the B Tech & M Tech instructional lab courses. It has all the facilities required for Analytical and Physical experiments, synthesis setups and for Acid-Base Titrations, Kinetic experiments, Electrochemical experiments, Spectrophotometry and so on.



(a)



(b)

Figure 2: General Chemistry Lab.

3 Material Characterization Lab

- **Floor Area:** 230 sq m
- **Overall capital expenditure:** 6 Crores
- **Major instruments/ equipments:** Mass spectrometer, Fourier Transform Infrared spectrometer, Electrochemical workstation, Crimping machine, De-crimping machine, Thermo gravimetric analysis, Differential Scanning Calorimeter, Gas permeability Tester, Dynamic Mechanical Analyzer, Portable Raman spectrometer, High-Performance Liquid Chromatography, Bomb Calorimeter, Bomb Calorimeter, Piezometer

- **Objective of the lab:** The Material Characterization (MC) Lab is equipped with sophisticated instruments for the characterization of materials of various classes and their application studies.



(a) Mass spectrometer.



(b) Permeability tester.



(c) Bomb calorimeter.



(d) Particle size analyzer.

Figure 3: Material Characterization Lab.

4 Nanoscience Lab

- **Floor Area:** 122 sq m
- **Overall capital expenditure:** 8 Crores
- **Major instruments/ equipments:** Scanning electron microscope, BET surface area analyser, Atomic force microscope, Phase contrast and polarised microscopes, Solar simulator, Multi lamp reactor, UV VIS NIR spectroscope, UV VIS spectroscope, Fluorescence spectroscope, Goniometer, Deep freezer, Corona poling unit, Orbital shaker, 2 Probe conductivity meter, Gel permeation chromatography

- **Objective of the lab:** The lab is well-equipped for morphological studies of materials, Photocatalytic studies, Fluorescence sensing, microscopic visualization, CO₂ adsorption, Surface area studies, Contact angle measurements, etc.



(a) SEM.



(b) Corona Poling Unit.



(c) Solar simulator.



(d) Surface Area Analyzer.

Figure 4: Nanoscience Lab.

5 OLED and Battery Fabrication Lab

- **Floor Area:** 50 sq m
- **Overall capital expenditure:** 1 Crore
- **Major instruments/ equipments:** Glove Box, Thermal evaporator, Four-probe instrument, Coin cell crimping machines, Planetary mixing machines
- **Objective of the lab:** OLED and Battery Fabrication Lab focus on the development of batteries, super capacitors and Organic Light Emitting Diode (OLED) displays.



Figure 5: OLED and Battery Fabrication Lab.

6 Organic Chemistry Lab

- **Floor Area:** 67 sq m
- **Overall capital expenditure:** 70 Lakhs
- **Major instruments/ equipments:** Rota evaporator, Flash chromatography, Vortex machine, pH meter, Centrifuge machine, Vacuum oven, Ice flaking machine, Probe sonicators, Bath sonicator, UV chamber, Magnetic stirrers, Vacuum pump
- **Objective of the lab:** The organic chemistry lab is one of the wet labs, where the preliminary steps for lab-scale synthesis of materials, mainly organic and inorganic materials. Students synthesize samples in this lab and are tested in other labs.



Figure 6: Inorganic Chemistry Lab.

7 Physical Chemistry Lab

- **Floor Area:** 65 sq m
- **Overall capital expenditure:** 1 Crore
- **Major instruments/ equipments:** Electrospinning Machines, Ultrapure water purification system, Rotary Evaporator, Atmospheric Pressure Plasma Reactor, Dip-coating unit, Spin coating, Cross Flow Filtration Unit, Sonicator, Magnetic stirrer
- **Objective of the lab:** This lab is intended to acquaint the students with the practice of experimental physical chemistry and to provide an environment to this area of scientific activity.



(a) Lab.



(b) Electrospinning Machine.

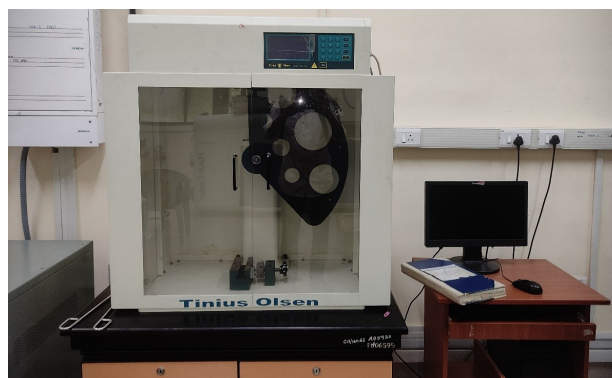
Figure 7: Physical Chemistry Lab.

8 Polymer Processing Lab

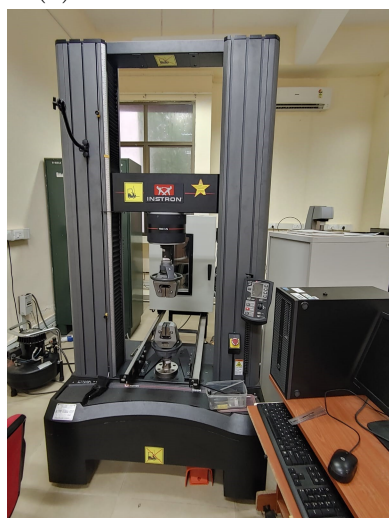
- **Floor Area:** 47 sq m
- **Overall capital expenditure:** 3.9 Crores
- **Major instruments/ equipments:** INSTRON Universal Testing Machine, Micro compounder with injection moulding, Modular Compact Rheometer, Pendulum Impact Tester, Internal Mixer with Twin Screw Extruder
- **Objective of the lab:** The Polymer Processing Laboratory is a state-of-the-art facility designed for research and development in the field of polymer materials. The lab's primary objectives are:
 1. To understand and characterize the mechanical properties of polymers and composite materials.
 2. To develop and optimize polymer processing techniques.
 3. To create new and innovative polymer materials.



(a) Twin Screw Extruder.



(b) Impact Machine.



(c) UTM.



(d) Micro Compounder.

Figure 8: Polymer Processing Lab.

9 Space Biology

- **Floor Area:** 24 sq m
- **Overall capital expenditure:** 18 Lakhs
- **Major instruments/ equipments:** Microgravity and hypergravity simulators, 3D printers, RH & temperature controlled incubator, stereo and polarised optical microscopes
- **Objective of the lab:** In this lab, we focus on three verticals -
 1. Study the impact of microgravity environment on biological phenomena.
 2. Develop spaceflight hardware to conduct life science experiments.
 3. Materials and systems for bioregenerative life support.