

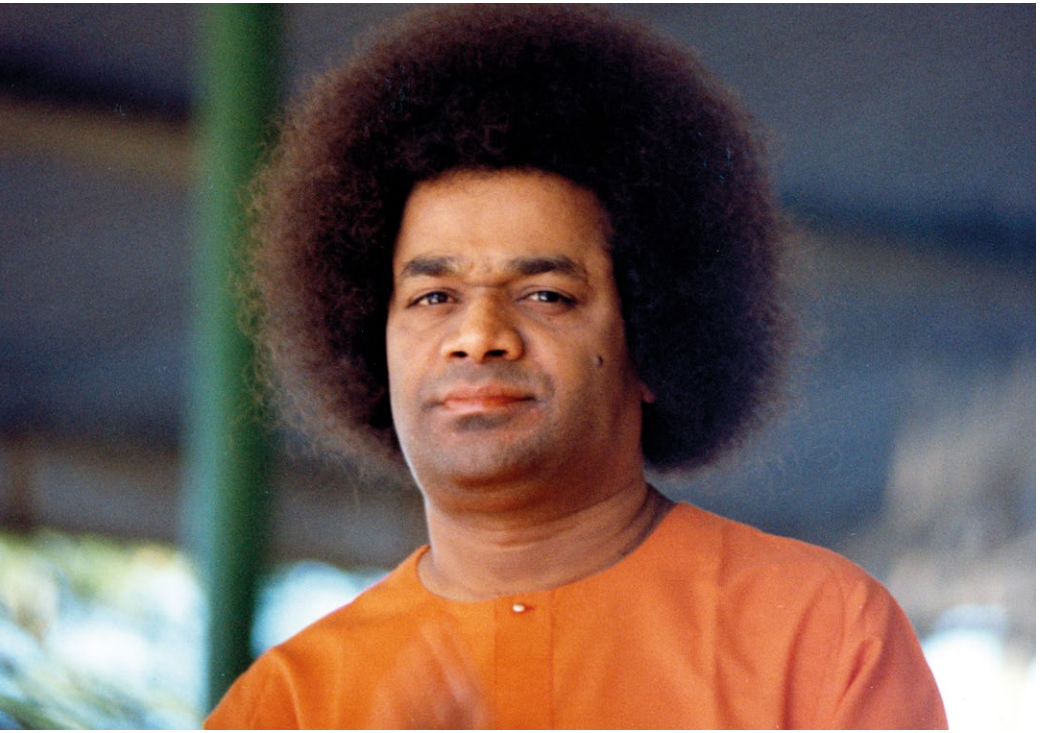


Central Research Laboratory

SRI SATHYA SAI INSTITUTE OF HIGHER LEARNING

ANANTAPUR CAMPUS





“In the field of science today, there is great emphasis on research and discovery. But, unless the results of research are applied in practice, it will be an expensive futility. If all the time is spent on research, when is it to find useful application in practice? Nor is there any sense of discrimination in the promotion of research...Those engaged in research seem to be more concerned about boosting their name and fame by their research than about promoting public well-being through the results of their research. Nor do they seem to be bothered about the harmful consequences of their discoveries...The scientific knowledge we acquire must be used for the benefit of our fellowmen.”

Bhagawan Sri Sathya Sai Baba
Revered Founder Chancellor

THRUST AREAS OF RESEARCH

Based on the guidelines laid down by the Founder-Chancellor, Sri Sathya Sai Baba, the research activities at the Sri Sathya Sai Institute of Higher Learning are pervasively translational, socially relevant, and intended to have a rural reach. The research work in which the faculty and students are involved encompasses three broad areas: Health, Environment and Energy. This brochure elucidates the research objectives, pertaining to the thrust areas, along with the state-of-the-art infrastructural facilities available in a customised laboratory called the Central Research Laboratory (CRL) to meet the research aspirations of the faculty and students at the Anantapur Campus of the Sri Sathya Sai Institute of Higher Learning (SSSIHL).

HEALTH



ENVIRONMENT

ENERGY



HEALTH



Health-related research at SSSIHL may be sub-categorized into three specific topics:

- » Medicinal Chemistry and Drug Discovery
- » Medically active natural products
- » Food and Nutritional Sciences

Medicinal Chemistry and Drug discovery

There is a pool of 'drug-like' compounds, of which a few million have been explored. This has staggering implications in the field of medicinal chemistry and drug discovery.

The area of research interest of the faculty at the Department of Chemistry involves the synthesis ofazole-based flavonones, targeting cytochrome CYP51 enzyme and the study of SAR for biological activity. Our work, also, involves extraction of gallic acid and arjunolic acid present in the plants, their purification and isolation; and the synthesis of their derivatives. The synthesised and derived bioactive molecules will also be studied by molecular docking.

Computational studies on adsorption interaction of various ions, with naturally occurring molecules, are being carried out.



Medically active natural products

Plants and fungi are a good source of active compounds, with potent pharmaceutical value, and are needed to be identified, quantified and evaluated. Therefore, research in the Department is focused on herb, *Trachyspermum ammi* L. (Ajwain) and on wild edible mushrooms from the Anantapur Campus. The highlights of the work include identification of phytochemicals, and testing for bio-activities such as anti-diabetic, anti-inflammatory and anti-proliferative effects in Ajwain; determination of nutritional, nutraceutical components; a fortification study and evaluation of medicinal properties of selected mushrooms.

Food and Nutritional Sciences

The faculty of the Department of Food and Nutritional Sciences are focussing on research related to three major areas of micro and macro nutrient malnutrition, and chronic lifestyle diseases. The various approaches of research include:

Food metabolomics

Metabolite profiling of nutrients and health-promoting compounds in novel and indigenous food crops such as culinary and herbal microgreens; medicinal pigmented rice varieties; spices; mushrooms; seed and legume sprouts, are being carried out to identify foods rich in essential micronutrients, and those beneficial for diseases such as diabetes. The effect of processing on the content of nutrients and nutraceuticals are also being evaluated.



Nutritional biology and metabolomics

The research focus under this area involves assessing the correlation of dietary composition and human health/ disease, and determining micronutrient bioavailability using yeast models, cell culture studies, and stable isotopic techniques.

Food fortification

Formulation and development of 'Sai Protein' based RUSF (Ready-to-Use Supplementary Foods); Calcium enriched fruit rolls; Soy-based fruit preparations; Mineral-fortified microgreens and sprouts, etc., are being carried out to address protein-energy, and micronutrient malnutrition.

Functional food product development

Another major area of research is the development of functional and therapeutic foods. Millet-based gluten-free cookies, legume-based baked foods and soup mixes, convenience foods for type II diabetes, probiotic- and prebiotic-enriched dairy and fruit products, aloe gel and chitosan incorporated health foods have been formulated.



ENVIRONMENT



Environment-related research at SSSIHL is mainly focused on water remediation, deflouridation, food-waste minimisation and utilisation.

Water Remediation

Nanotechnology has revolutionised the scientific and technological fields. Environmental safety is no exception. One of the most promising and well-developed environmental applications of nanotechnology has been in water remediation and treatment. The presence of contaminants in water is hazardous both to the environment and human health. These need to be removed before it is usable for various needs. Hence, the research concentrates on using nanomaterials for environmental remediation and meeting WHO standards of water.

The main objectives are:

- » Engineering green-nanotechnology based, non-toxic, highly efficient, and cost-effective nanoadsorbents which would pave way for the efficient removal of contaminants from water
- » These materials can further be incorporated in the design of simple, affordable, and safe water filters, to be used in several rural parts of India



Defluoridation

The Department of Chemistry aims at formulating highly efficient defluoridating agents for the effective removal of fluoride to alleviate the existing fluoride menace. The biocompatible and biodegradable polymers - metal ion-based cross-linked composites are synthesised by 'green protocol' for effective removal of fluoride from water. This study is being extended, by using composites of blends of different polymers to understand the binding of fluoride with polymer metal-composites. The aim is to develop user-friendly, inert, highly effective defluoridating agents. A water filtration technology, which is useful for heavy metal and fluoride removal using robust polymer composite, is being designed and developed. Moreover, graphene-based macroscopic assemblies with the polymer are synthesised to explore its application in the fields of heavy metal adsorption, sensing, oil spill and dye removal.

Minimisation of post-harvest loss and food waste utilisation

The Department of Food and Nutritional Sciences are working on environment-friendly bio-based edible coatings have been developed to extend shelf life and minimise post-harvest loss of various fruits and vegetables such as papaya and tomatoes. Studies on the utilisation of by-products and waste from fruit industries, as sources of bioactive compounds and bio-colours, is a recent area of research focus.

ENERGY



Energy-related research at SSSIHL, led by the Department of Physics, aims to develop novel materials in nano/ bulk scale for various applications. Research activities undertaken by the Department can be broadly classified into the following sub-areas under energy storage and harvesters:

Energy storage and Energy Harvesters

Magnetic Materials for Energy storage and memory applications

Magnetic nanoparticles exhibit interesting properties including anti-ferromagnetism, super-para-magnetism, and other functional properties due to their quantum size effects. Nanospinel ferrites are not only of great interest in fundamental science, but also have a wide variety of applications.

Thus, the research aims at:

- » Synthesis of magnetic nanospinel ferrites
- » Systematic investigation of their properties

- » Application of nanoferrites in the development of devices for energy storage, dielectrics, magnetic storage, and sensing applications
- » Fabrication of novel materials for piezo-magnetic, magneto-dielectric, and magneto-electric applications in combination with other ferroic materials

Solar cells

Solar energy is an abundant and perennial source of energy which needs to be tapped as a solution to the increasing energy crisis. Hence, the research aims to develop novel materials that include:

- » Phase pure pyrite nanomaterials as absorber in solar cell applications
- » Synthesis of ferroelectric materials for solar energy applications

The faculty of the Department of Food and Nutritional Sciences are focusing on energy-related research for food processing.

Low energy intensive food processing

Processing of foods using osmotic dehydration and solar drying methods are being explored as avenues for technology transfer to rural women entrepreneurs.

SRI SATHYA SAI INSTITUTE OF HIGHER LEARNING CENTRAL RESEARCH LABORATORY (CRL)

GENESIS

The members of the faculty across all the Science departments at the Sri Sathya Sai Institute of Higher Learning have been engaged in research work for several years now.

However, the opening up of research at the undergraduate level of study at the SSSIHL, Anantapur Campus — the only women's Campus of the University — in the last couple of years, has given a major boost to the enthusiasm of both the doctoral research scholars and teachers of the Campus.

Needless to say, the establishment of the Central Research Instruments Facility (CRIF) at the Prasanthi Nilayam Campus has added an impetus to research across the Institute by providing state-of-the-art facilities and infrastructure; and the women doctoral research scholars have been visiting the CRIF at Prasanthi Nilayam, for short periods, to conduct experiments there ever since.

Although, by and large, the research work in different Departments is being carried out satisfactorily, the esteemed Vice-Chancellor of our University, Prof. K B R Varma, felt that there was a need to strengthen the research facilities locally, so that the scholars and teachers from the Anantapur Campus of the SSSIHL do not have to commute frequently to

undertake research work. As a result, this mini-CRIF will enable the researchers of the SSSIHL, Anantapur Campus, to perform their experiments and conduct basic procedures seamlessly, without any hindrance.

Indeed, it was a stupendous decision, requiring meticulous investigation and planning regarding, firstly, the space; and secondly, the provision of infrastructure.

Both these challenges were met with unequivocally. Consequently, with the divine blessings of Bhagawan Baba, the support of the Sri Sathya Sai Central Trust, and the zealous and ardent commitment of the Vice-Chancellor and the University Administration, the dream of a mini-CRIF at Anantapur became a reality in the form of the Central Research Laboratory (CRL) in August 2019.

This laboratory is intended to be extensively used by postgraduate and doctoral students, as well as the faculty.

The following core facilities are the shared resources of the research community at the Anantapur Campus of the SSSIHL.

FACILITIES

WET CHEMISTRY LABORATORY

MATERIALS SYNTHESIS

High Pressure Stirred Hydrothermal Reactor

Planetary Ball Mill

Microwave Reactor

Heidolph Rotary Evaporator

Heraeus Multifuge X3 FR Centrifuge

All Quartz Double Distillation Unit

Upright Freezer

Sample Concentrator

Probe Sonicator

Digital Dry Bath

Vacuum Concentrator

Stomacher Lab Blender

Spray Dryer

Freeze Dryer

Ultrasonicator

Icemaker

Micro-Analytical Balance

Precision Balance

Orbital shaker with temperature control

Centrifuge

Hydraulic pellet press

High Temperature Facilities

Nabertherm High-Temperature Furnace

High-Temperature Furnace

Muffle Furnace

Hot Air Oven

Vacuum Oven

CHARACTERIZATION

Thermal Analysis

FT-IR Spectrometer

UV Visible spectrophotometer

Tensiometer

Molecular Imager with Image Lab Software

Waters Binary HPLC System

WET CHEMISTRY LABORATORY

State-of-the-Art Wet Chemistry Laboratory

This laboratory has world-class work benches. The fume cupboards are equipped with vacuum as well as inert gas facilities.

All operations required in synthetic experiments can be carried out. These include reactions at both low and high temperatures, reactions in inert gas atmosphere, low pressure distillation, etc.

This laboratory is also useful in carrying out chromatographic experiments for the separation of compounds. It is equipped to synthesise functional materials (organic and inorganic) at different length scales (including nanometers to micrometer sized crystallites) using a variety of synthetic routes.



SYNTHESIS FACILITIES

High Pressure Stirred Hydrothermal Reactor (Amar Equipments)

Features

- » 450mL Teflon-lined SS vessel
- » Design pressure: 100 bar
- » Maximum working temperature: 300°C (180°C with PTFE liner)
- » High-pressure reactor with safety rupture disc
- » Zero-leakage magnetic drive cooling
- » Two-stage 6-blade turbine stirrer and clamp
- » External ceramic bar heater and insulation
- » Gas-purging facility available
- » Table-top model

Capabilities

- » Synthesis of chemical compounds(wet chemical synthesis)

The stirred hydrothermal reactor enables the researcher to synthesise compounds under high pressure, controlled temperature, and continuous stirring. This method will allow synthesis of nanoparticles, and control over morphology as well.



Planetary Ball Mill (Planetary Micro-Mill PULVERISETTE 7 premium line, Fritsch GmbH Germany)

Features

- » Rotational speed of main disk 100-1100 rpm
- » Safe operation – due to the revolutionary self-lock, grinding bowls snap into place in the machine without any additional clamping
- » Blocking of the mill in the event of impermissible operating states
- » Automatic shut-off functions, if an imbalance occurs
- » Prevention of impermissible grinding settings due to automatic detection of inserted grinding bowls and optimisation of rotation speed
- » Automatic parameter checks before each grinding guarantees exact reproducibility
- » Added time savings and reliability due to fast bowl changes
- » Simultaneous comminution of up to 2 samples

Capabilities

The Planetary Micro-Mill PULVERISETTE 7 premium line, with two grinding stations, is designed for a broad range of applications, and ideally suited for loss-free grinding down to a final fineness of 100 nm of hard, medium-hard and brittle materials. Depending on the desired final fineness, the grinding can be performed dry, in suspension. In addition to comminution, Planetary Mills can also be used for mixing and homogenising emulsions and pastes, or for mechanical activation and alloying in materials research.



Microwave Reactor (CEM Focused Microwave™ Synthesis System Model: Discover LABMATE)

Features

- » Power output of 0-300 watts (+/- 30 watts)
- » Self-adjusting, single-mode microwave cavity
- » Three safety interlocks, and an interlock monitoring system to prevent microwave emission
- » IntelliVent™ Pressure Control System for an indirect measurement of the reaction vessel contents
- » Fluoro-polymer sleeved cavity, with cavity access port and microwave leakage choke

Capabilities

- » To perform chemical reactions under controlled conditions on a laboratory scale
- » Facilitates either homogeneous- or heterogeneous-solution phase chemistry, solid phase chemistry, or chemistry conducted on solid supports
- » Accommodates vessels ranging in volume from 5mL to 125mL for reactions performed under atmospheric conditions
- » A 10mL vessel with septa for reactions performed at elevated temperatures and pressures

Microwave energy is applied to the vessel contents (reactants, catalysts, salts, solvents, and/or solid supports) to accelerate the chemical reaction. The microwaves interact with the reactants, intermediates, catalysts, solid supports and salts, providing unique opportunities for the synthetic chemist. It primarily helps the researcher in the discovery and optimisation of the new product-development process.



Heidolph Rotary Evaporator (Hei-VAP Value Digital, G3)

Features

- » Hand/ Motor lift: Hand lift
- » Lift distance: 155mm
- » Rotation speed: 10-280 rpm
- » Heating capacity: 1300 W
- » Temperature range of the heating bath: 20°C to 100°C H₂O/20 - 210°C oil
- » Temperature accuracy of bath: ±1°C
- » Bath temperature protection heating bath: cut-off at 5°C difference to set temperature
- » Overheat protection: 250°C
- » Display bath temperature: Digital
- » Condensing surface: 1400 cm²
- » Supply power: 1400 W
- » Standard supply voltage: 230 V/50 Hz
- » Operating conditions: 5°C to 31°C at 80% relative humidity, no condensation 32-40°C linear decrease down to 50% relative humidity
- » Dimensions with glassware set G3: 739 × 490 × 887 mm (w × d × h)

Capabilities

- » Chemical-resistant vacuum seal allows for years of operation
- » Bath-power-cable coupling complies with protection class IP67 to reduce corrosion and short circuits
- » Detachable panel allows for the highest operational safety from outside closed fume hoods
- » A separate on/ off switch for heating prevents unintentional heat-up, and the button is illuminated for visual control
- » A metal support between the heating bath and the base unit prevents bath instability
- » Safety bath will power off if temperature overshoots by 5°C, or runs dry
- » The flange made of chemical-resistant PPS reduces corrosion and maintenance
- » Non-sticking vapour tube, with patented clamping sleeve, eliminates broken glass



Heraeus Multifuge X3 FR Centrifuge (Thermo-Scientific)

Features

- » Program Storage: 99 programs (5 with direct access key)
- » Run Time: 99h, 59 min plus HOLD
- » Capacity: 4 x 1000mL
- » Max. RCF: 25,314 x g
- » Max. Speed: 15,200 rpm
- » Refrigerated: Yes, CFC-free refrigeration system
- » Temperature Range: -10°C to +40°C, pre-cooling with direct button
- » Display: Digital
- » Electrical Requirements: 230V 50/60Hz
- » Secure locking system allows easy push-button installation and exchange of rotors
- » Fiberlite F15-6x100y Fixed-Angle Rotor
- » Fiberlite F14-6 x 250 Fixed Angle Rotor
- » Fiberlite F21-48 x 1.5 Fixed-Angle Rotor
- » TX-750 Swinging Bucket Rotor

Capabilities

The high-speed refrigerated centrifuge is suitable for processing temperature-sensitive samples. It includes a variety of rotors applicable for a wide range of biological samples of various volumes, at different temperatures.

Separation of components in various biological samples related to cell culture, microbiology, proteomics, genomics, biochemistry, molecular biology, bio-production, blood, etc.



All Quartz Double Distillation Unit (BOROSIL)

Features

- » Distilled water output capacity: 5L/h
- » Consumption of cooling water: 150 L/h
- » Distillate temperature: 65-75°C
- » Purified water pH: 6.9-7

Capabilities

Collection of highly purified pyrogen-free double distilled water

Upright Freezer (Vestfrost)

Features

- » Single Solid Door
- » Optional digital controller with display
- » 8 shelf + drawers
- » Super-freeze function
- » High temperature alarm
- » Capacity: 344L

Capabilities

A -25°C upright freezer with separate shelves and drawers for segregated storage of different biological and chemical samples.



Sample Concentrator (Stuart)

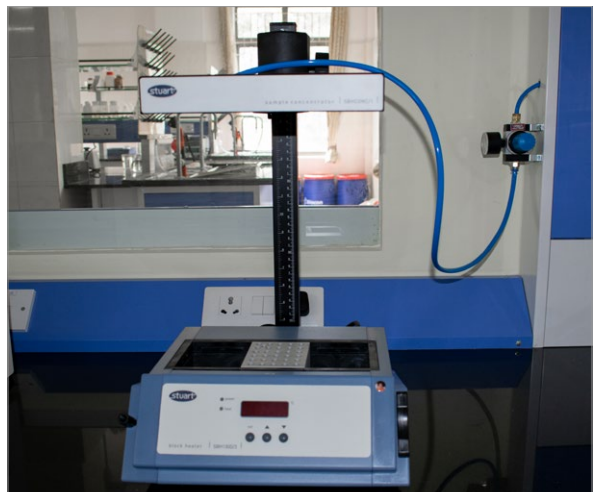
Features

- » Fast, efficient sample concentration
- » Suitable for all tube configurations
- » Height of the sample concentrator gas reservoir is located on an adjustable stand for accurate height control
- » The gas delivery needles are available in either 76mm or 127mm lengths to suit various tube heights
- » Optional PTFE coating is available for corrosive solutions

Capabilities

- » Sample concentration
- » Enzyme analysis
- » Sample incubation & boiling
- » Wet washing

The Stuart sample concentrator is a fast and convenient way of concentrating multiple samples in a block heater at once. Utilising a simple nitrogen gas delivery system, the sample concentrator passes gas over the surface of the samples via stainless steel needles. This, in combination with the heat from the block heater below, produces ideal conditions for fast, efficient evaporation.



Probe Sonicator (Branson SonifierSFX 150c)

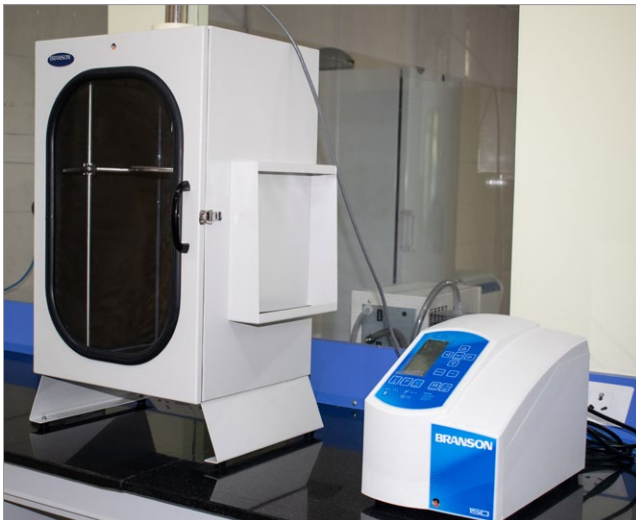
Features

- » Ergonomic handheld converter with contoured grip and LED indicator
- » Quiet operation at 40 kHz
- » Continuous or pulsed ultrasonics
- » Time and energy modes with energy pulsing
- » Experiment progress indicator

Capabilities

- » Cell Disruption & Lysis
- » Dispersal of Nanoparticles
- » Fine Mixing
- » Degassing

The probe sonicator is designed for low-volume applications. It is the only cell disruptor and homogeniser of its type that includes a handheld converter designed for ergonomic comfort and easy control to simplify and speed up experiments. The recessed push-button helps prevent unintended activation, while the LED indicator light lets you know when it is energised.



Digital Dry Bath (Labnet Dual Block)

Features

- » Dual-heating block
- » Temperature range: ambient +5 °C to 150 °C
- » Temperature Uniformity: $\pm 0.2^{\circ}\text{C}$
- » Display increments: $0.1^{\circ}\text{C}/\text{min}$
- » Timer from 1 min to 99 h 59 min
- » USB interface

Capabilities

- » HPLC & LC-MS sample preparation
- » Applications in clinical, molecular biology and other fields

Labnet digital dry bath is robust, versatile, and quality equipment suitable for advanced research applications. Labnet's integrated microprocessor provides precise and accurate control of temperature. Its high-quality, precision-engineered blocks provide excellent thermal contact. The result is accurate, reproducible, and ensures safe heating of samples.



Vacuum Concentrator (MiVac Duo, DUC - 23050-L00)

Features

- » Built-in high-performance vacuum pump
- » Concentration chamber with electro-magnetic drive for quiet, maintenance-free operation
- » Fixed-angle aluminium rotor for 1.5mL/2mL micro-centrifuge tubes
- » Clear, acrylic lid to monitor progress
- » Temperature range: 30° C – 80° C
- » Max g-force: 250
- » Fixed speed: 750 rpm
- » Timer up to 99 min
- » Fast evaporation
- » Environmentally friendly

Capabilities

- » Mass spectrometry sample preparation
- » Clinical & diagnostic testing
- » DNA concentration
- » Oligonucleotides and DNA purification

MiVac is a new range of centrifugal concentrators, featuring built-in special methods for removing organic solvents, water, and water mixtures from a variety of sample formats, including tubes, microplates, vials, and round-bottom flasks, thus improving performance, and optimising concentration time.



Stomacher Lab Blender (BagMixer®400 CC)

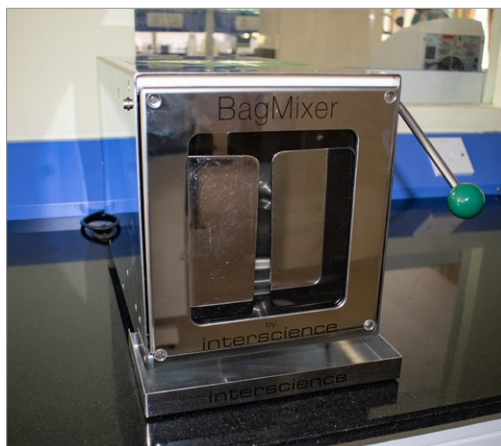
Features

- » Digital screen
- » Capacity: 50 to 400 mL
- » Leak-free Q-tight® system
- » 270° opening door
- » Silent brushless motor
- » Blending power indicator
- » Blending speed – 4 to 10 strokes per second
- » Adjustable blending power: up to 28 kg of pressure
- » Window-door
- » Security drip-tray
- » Removable and auto-clavable paddles
- » Click and Clean® system
- » Compact and ergonomic

Capabilities

- » Homogenises different biological samples
- » Provides sterile conditions during homogenising
- » Useful for microbiological examination of various biological samples

BagMixer® 400 CC® is an easy-to-use and powerful lab blender. It is adapted to all kinds of applications, with a guarantee of optimal bacterial extraction. It is a great tool for lab analyses, avoiding all risks of cross-contamination.



Spray Dryer (Technosearch Instruments)

Features

- » Suitable for Aqueous / solvent feed
- » Evaporation Rate: 1L/h of water evaporation
- » Drying Temperature: Ambient to 280°C, accuracy +2°C in step of 0.1°C through Digital PID controller.
- » Air Heater Capacity: 3.0kW
- » Blower Capacity: 80 Nm³/h with variable frequency drive, in steps of 0.1 Hz
- » Blower Motor: 0.25HP x 2800 rpm, three phase
 - › Single phase 230V AC input & three phase 230V AC output
- » Feed Pump Capacity: 1200mL/h with 3mm ID tube with variable speed control in step of 1mL/min capacity controlled through Microcontroller
- » Spray System Co-current - 0.7mm, two fluid spray nozzles
- » De-blocking system: Manual Spring Loaded
- » Hot Air Flow: Co-current

Capabilities

- » Quick drying of liquids is achieved by the application of hot gases which efficiently turn solutions into dry powders.
- » Virtually any feedstock that can be pumped -- solutions, suspensions, slurries, melts, pastes, gels, can be spray dried
- » Spray drying produces powders of uniform particle size and ensures minimum flavour loss
- » Inorganic and organic products like pigments, corn starch and milk can be dried
- » Encapsulation of food aromas and volatile oils
- » Calciums / Carbonators / Aluminium Chloride, Zeolite, etc.
- » Miscellaneous polymers and resins for allied industries: Milk, milk derivatives, soybean products, tea, coffee, instant foods, baby foods, weaning foods, egg products, chocolate, etc. Palm / Orange / sandalwood/ groundnut / Cod liver oil, etc.
- » Encapsulated flavours or fragrances / perfumes: Mono-/ mixed spices, day-to-day body odours – Brut, Eu-de-cologne, Musk, Lavender, Rose, Sandal wood, etc.
- » Reactive/ disperse dyes for textile-dyeing and engineering pigments, optical whiteners, etc.
- » Quality Ceramics with special electro-mechanical properties for tiles, ceramic, ortho-dentistry, etc. Ready-to-make soft drinks / cocktails, etc. Specialty alloys, precious metals, etc.



Freeze Dryer (Lyodel)

Features

- » Condenser with maximum ice capacity of 5 kg, temperature $-55 (\pm 5^{\circ}\text{C})$ @ 20° ambient, volume of 7.2 L, and evaporation rate of 85-95 cc/h
- » Compressor (Danfoss Germany) with heat extraction rate of 180 kcal/h at -35°C
- » Instrument has digital RTD temperature gauge, and digital Pirani vacuum gauge



Capabilities

The freeze drying process can preserve antibiotics, anticoagulants, antitoxins, enzymes, fungi, biological reagents, biological standards, blood fractions, vitamins, yeasts and ferments, and culture media.

The Lyodel model (Delvac) is a multipurpose freeze dryer. It is used for the lyophilisation of the bulk sample, using trays. The vertically positioned ice condenser, and bottom drain in the front, makes this bench top Lyodel model easy to use. The control panel has digital indication for both condenser temperature and vacuum pressure.

Ultrasonicator (Branson)

Features

- » Bath size 290 mm (11.5 in.) × 150 mm (6 in.) × 150 mm (6 in.)
- » Bath volume: 5.7L. Degassing can be set up to 99 min
- » Timer can be set to 99 minutes or run continuously
- » Heated cleaning - upto $69^{\circ}\text{C} / 156.2^{\circ}\text{F}$
- » Self-adaptive technology
- » Fully Programmable
- » High/ low Power Control
- » Branson 100-916-335 Mesh Basket



Icemaker (BR BIOCHEM)

Features

- » Ice-making capacity: 20kg/24h
- » Ice Storage: 10kg
- » Air Cooling
- » Stainless Steel 304 Exterior
- » Adjustable Feet
- » Slide-Away Access Door
- » World-Famous Brand Compressor
- » Fully Automatic Controller
- » Improved Design For Higher Reliability

Micro-Analytical Balance (Radwag)

Features

- » Maximum capacity [Max]: 82/220 g
- » Minimum load: 1 mg
- » Readability [d]: 0.01/0.1 mg
- » Tare range: -220 g
- » Repeatability: 0.015 mg
- » Linearity: ± 0.06 mg
- » Sensitivity drift: 1 ppm/ $^{\circ}$ C in temperature 10 $^{\circ}$ C to 40 $^{\circ}$ C
- » Minimum weight (USP): 30 mg
- » Minimum weight (U=1%, k=2): 3 mg
- » Stabilisation time: 6/3, 5s
- » Adjustment: internal (automatic)
- » Communication interface: 2 \times RS 232, USB-A, USB-B, Wireless Connection (optional)



Precision Balance (Radwag)

Features

- » Max. capacity: 220 g
- » Minimum load: 10 mg
- » Readability[d]: 0.1 mg
- » Tare range: -220 g
- » Repeatability: 0.1 mg
- » Linearity: ± 0.2 mg
- » Stabilisation time: 3.5s
- » Pan Size: 100 mm
- » Model No: WTC 200
- » Maximum capacity [Max]: 200 g
- » Readability [d]: 0.001 g
- » Tare range: -200 g
- » Repeatability: 0.002 g
- » Linearity: ± 0.004 g and stabilisation time: 2 sec



Orbital Shaker with Temperature Control (Newtronic)

Features

- » Chamber Volume (Litres): 270
- » Platform Size mm: 745 x 490(15kg)
- » Internal Dimensions (H x W x D) mm: 450 x 900 x 670
- » External Dimensions (H x W x D) mm: 700 x 1380 x 1020
- » Temperature Range: 5°C to 60°C (Accuracy): $\pm 1^\circ\text{C}$
- » Inner and outer Chamber S S 304
- » Touch-screen display
- » Universal Platform to accommodate interchangeable molded clamps of assorted sizes for different capacity of flasks: 100mL, 250mL, 500mL
- » PLC-based Temperature Controller
- » Variable speed from 50 rpm to 300 rpm
- » Shaking amplitude 25 mm



Centrifuge (Remi)

Features

- » With swing out rotor for 6x50 mL tubes
- » Model of rotor: ER S6 50
- » Max. speed: 6000 rpm with timer 0-99 min
- » Dimensions: 38 cm x 47 cm x 30 cm

Capabilities

Laboratory Centrifuge is suitable for routine sample analysis in biochemical and chemical applications. It is used for separation of fluids and solids from liquids, based on their density.

Hydraulic Pellet Press (PCI Analytics)

Features

- » 15 ton hydraulic pellet press
- » Dimensions: 30cm x 27cm x 42.5cm
- » Overall weight: 50kg
- » Maximum permissible pressure: 15 ton
- » Maximum permissible holding time: 10 min
- » Size of die set: 13 mm
- » Hydraulic oil capacity: 400mL

Capabilities

Hydraulic pellet press is a compact, elegant, and robust hand-operated machine. It is used for compaction of pellets used for various applications such as XRF, FTIR, dielectric, density measurements, and so on



HIGH-TEMPERATURE FACILITIES

High-Temperature Furnace (Nabertherm)

Features

- » Heating Elements: Silicon Carbide
- » Temperature: Max (1500°C)
- » Safe operating temperature: 1350-1400°C
- » Can be used to calcine and sinter materials at elevated temperatures
- » Gas-purging facility available



High-Temperature Furnace (Delta power controls)

Features

- » Heating Elements: Silicon Carbide
- » Temperature: Max (1500°C)
- » Safe operating temperature: 1350°C
- » Can be used to calcine and sinter materials at elevated temperatures



Muffle furnace (Delta power controls)

Features

- » Heating Elements: Kanthal (wire wound)
- » Temperature: Max. (1050°C)
- » Can be used to calcine and sinter materials at temperature up to 950°C
- » Safe operating temperature: 900°C



Hot Air Oven (Newtronics)

Features

- » Temperature range: 50°C to 250°C
- » Chamber volume: 50L and 90L
- » Can be used for drying samples and heating hydrothermal reaction vessels



Vacuum Oven (Newtronics)

Features

- » Temperature range: 40°C to 200°C
- » Temperature Accuracy: $\pm 2^\circ\text{C}$
- » Chamber volume: 30L
- » The PID controller with integrated timer (0 to 99h), and provision of a ramp and soak function
- » Can be used for drying of heat-sensitive and highly hygroscopic materials



CHARACTERISATION FACILITIES

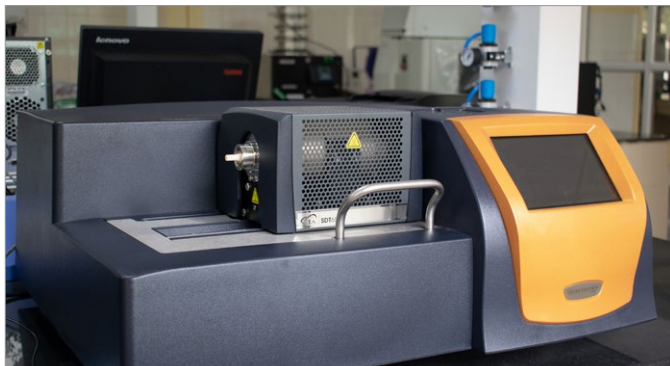
Thermal Analysis Simultaneous DSC-TGA Analyzer (TA instruments)

Features

- » Horizontal dual-beam design for superior heat flow and weight measurements
- » Dual-sample TGA mode for double the productivity of competitive systems
- » Ultra-low drift balance design for unrivaled performance in baseline flatness, sensitivity, and resolution
- » Modulated DSC for the best determination of heat capacity
- » Hi-Res TGA for the best separation of overlapping weight losses
- » Modulated TGA for increased productivity for studying kinetics
- » Innovative Gas-Delivery manifold design and integrated software-controlled gas switching
- » New innovative 'app-style' touch screen enhancing usability and making it easier than ever to get great data

Capabilities

Discovery SDT 650 is an innovative SDT with unrivaled performance in weight drift, sensitivity and simultaneous DSC and TGA measurements. It features an exclusive horizontal dual-beam thermos-balance. The integrated thermocouple design, within the ceramic beams, provides direct sample, reference, and differential temperature measurements. This ensures superior DSC and TGA performance without requiring baseline subtractions and other post-test manipulation.



FT-IR Spectrometer (Spectrum Two, Perkin Elmer)

Features

- » Portable FT-IR system
- » Wavelength range: 4500-450 cm^{-1} using KBr beam splitter; 6500-650 cm^{-1} using ZnSe
- » Rotatory Michelson Interferometer
- » High linearity room temperature detector
- » Atmospheric Compensation and Error trapping
- » Operating range: 5°C to 45°C

Capabilities

- » It records Infrared spectrum of solid and liquid samples.
- » It includes Beer's Law and chemometrics-based quantitative prediction by use of software
- » Helps de-convolute, baseline correction, normalise, and extrapolate the spectra

The FT-IR allows the researchers to determine the functional groups in the synthesised compound. Each molecule or chemical structure produces a unique spectral fingerprint, making FTIR analysis an efficient tool for chemical identification. The infrared spectrum helps in identifying unknown compounds. It is also useful in studying the metal bonding interactions and presence of additives in polymer matrix.



Cary 60 UV-Vis Spectrophotometer (Agilent)

Features

- » Light source: Xenon pulse lamp (Immunity to room light)
- » Beam-splitting system: Beam splitter
- » Detectors: 2 silicon diode detectors for simultaneous sample beam and reference beam measurements
- » Optical design: Double beam
- » Wavelength: 190-1100 nm
- » Wavelength accuracy: ± 0.5 at 541.94 nm
- » Data interval: 0.15 – 5.0 nm
- » Focused beam measurement: 1.5 x 1.0 mm
- » Minimum sample volume: 0.5 μL
- » Dimensions and weight: 19 x 23 x 8 in and 18 kg

Capabilities

- » Wavelength range of 190-1100 nm. Completely covers UV-Vis range and extends up to near IR
- » Allows complete spectral range scanning in under 3 seconds, ideal for fast kinetics or high sample throughput
- » Data collection rate of 80 data points/ second. Allows accurate measurement of sub-second kinetic reactions with excellent data-fitting
- » Room-light immunity which allows for unique optical design for accurate sample measurement, even with the sample lid open. Especially useful for enzyme assays, fiber-optic-based measurements
- » Xenon pulse lamp source which eliminates photo bleaching, while allowing the highest quality data to be collected over the complete UV-Vis range



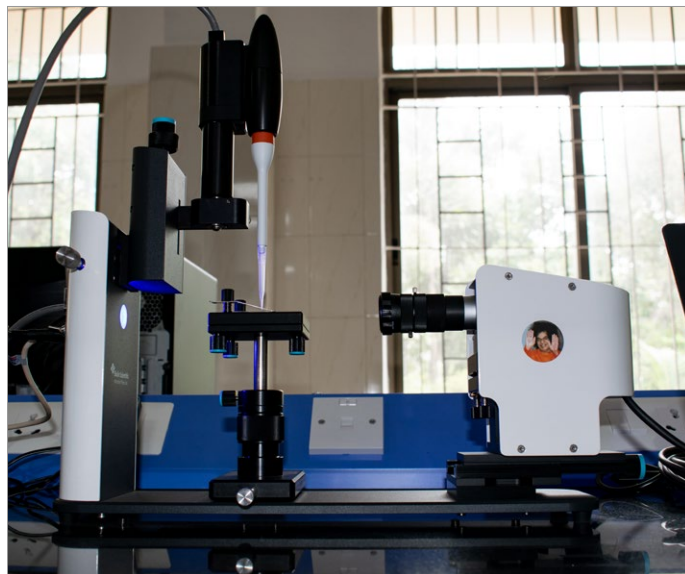
Tensiometer (Biolin Scientific, Sweden)

Features

- » USB 3.0 digital camera, max. 2068 fps
- » Automatic single liquid dispenser using disposable pipette tips
- » Integrated sample stage 10mm.
Movement range in x direction:
Movement range in z direction: 10mm
- » Full One Attension Software for determination of:
 - › Contact angle by sessile/raising drop method with automatic base line detection
 - › Batch sessile drop experiment to measure and analyse contact angles on several samples
 - › Surface/interfacial tension by pendant/raising drop method
 - › Contact angle by liquid meniscus method
 - › Surface free energy, based on calculation equations

Capabilities

Measures surface wettability, surface tension of the liquid, free energy of the solid and static and dynamic contact angles. The Optical tensiometer allows researchers to check the wettability of the synthesised material through surface energy calculations. The hydrophobicity or hydrophilicity of the material is determined by contact angle



measurement. This is useful for applications of oil spill removal, dye removal, edible coatings, printing, and anticorrosion painting.

Molecular Imager with Image Lab Software (BIO-RAD ChemiDoc XRS+)

Features

- » Automated workflow selection, execution and reproducibility
- » Illumination: Trans-UV, epi-white, trans-white, XcitaBlue (UV/Blue) conversion screen
- » Detector: Super-cooled CCD
- » Image resolution: 4 megapixels (6.45x6.45µm)
- » Cooling system: Peltier
- » Camera cooling temperature: -30°C controlled
- » Filter holder: 3 (2 for filters, 1 for Chemiluminescence)
- » Emission filter: 1 included, 3 optional
- » Operating voltage: 110/115/230 V AC nominal
- » Operating temperature: 10-28°C (21°C recommended)

Capabilities

The ChemiDoc XRS+ system provides reliable quantitative data for characterising DNA and protein samples. It enables direct digital visualisation of western blots for accurate images of signal from chemiluminescent reactions. It is suitable for biochemistry, microbiology, molecular biology and pharmacogenomics.

- » Automated workflow selection, execution and reproducibility
- » Illumination: Trans-UV, epi-white, trans-white, XcitaBlue (UV/Blue) conversion screen
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- » Operating temperature: 10-28°C (21°C recommended)



Waters Binary HPLC System (Waters Corporation)

Features

- » Waters Binary HPLC System has 1525 Binary HPLC pump, 2998 Photodiode Array Detector, 1500 Column Heater and Breeze 2 software.
- » Performance specifications for 1525 Binary Pump:
 - › Programmable flow rate: 0.00 to 10mL/min, in 0.01 mL/min increments
 - › Maximum Operating Pressure: 41,368 kPa (414 bar, 6000 psi)
- » Performance specifications for PDA detector:
 - › Wavelength range: 190 to 800 nm
 - › Optical resolution: 1.2 nm
 - › Photodiodes: 512
 - › Digital resolution: 1.2 nm/ pixel
 - › Wavelength accuracy: ± 1.0 nm
 - › Wavelength repeatability: ± 0.1 nm
 - › Waters Binary HPLC system allows compound purification and isolation





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