PLACEMENT CELL

सीएसआईआर
CSIR
भारत का नवाचार इंजन
The Innovation Engine of India

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सीएसआईआर का अंतर्विषयी आयाम
Interdisciplinary face of CSIR

सीएसआईआर - राष्ट्रीय अंतर्विषयी विज्ञान तथा प्रौद्योगिकी संस्थान

CSIR - NATIONAL INSTITUTE FOR INTERDISCIPLINARY SCIENCE AND TECHNOLOGY

About CSIR-NIIST

The National Institute for Interdisciplinary Science and Technology (NIIST) in Thiruvananthapuram is a constituent laboratory of Council of Scientific and Industrial Research (CSIR). Originally established in 1975 as a CSIR Complex, it was later renamed as the Regional Research Laboratory in 1978 and then as NIIST in 2007. Its primary objective is to carry out high-quality research and development activities in areas that are crucial for the effective utilization of regional resources and are of fundamental importance to the country. At present, NIIST is actively involved in various research and development programs, including agro-processing, chemical sciences, sustainable energy, materials science, microbial processes, and environmental technology. The institute has also played a significant role in the development of human resources by providing training to postgraduate and graduate students. To date, over 260 Ph.D. degrees have been awarded based on research conducted at the institute.

Dr. C. Anandharamakrishnan
Director

Director's Message

Greetings from CSIR- National Institute for Interdisciplinary Science and Technology (CSIR-NIIST)!

CSIR-NIIST is devoted to contributing to research and education in diverse areas of Science and Technology. NIIST strives to strengthen research partnerships with industries and research institutions. The institute provides a conducive setting for students to delve into specialized research fields and hosts various events such as colloquia, seminars, conferences, and lectures by experts to enhance knowledge dissemination. NIIST promotes innovative ideas and endeavors to achieve international acclaim for its academic programs and research initiatives, producing PhD graduates skilled in cutting-edge technologies.

Agro Processing and Technology Division

About APTD

Agro Processing and Technology Division (APTD) of CSIR—NIIST Trivandrum provides high quality scientific and technological solutions with niche focused approach in the form of processes and products and knowledge with international benchmark. Notable achievements include the CSIR Shield for Process Technology 2004 for "Swing Technology and the NRDC National Technology Award 2003. The main areas of expertise are bio degradable cutleries, vegan leather, vegan food products, vegan alternatives for diary based products, post-harvest processing technology, bio actives for life style disorders and crop protection

- Plant proteins and lipids
- Nano food processing
- 3D food printing
- Development of plant based alternative (vegan) to dairy products
- Sustainable plastic and leather alternatives development
- Biopolymer extraction from agro-industrial by-products and gut health
- Sustainable materials development for food packaging
- Food fortification and functional foods
- Pickering emulsions, emulsions and emulgels
- Structured and functional lipids
- Block chain application in food
- CFD modelling in food and Bio-processing
- Innovative food processing
- Nutri-genomics and exosome research
- Pharmacological interventions & metabolic disorders

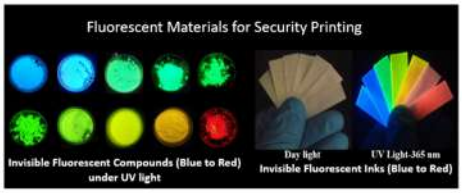
Analytical Facilities

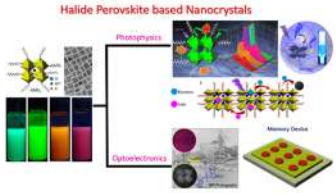
Chemical Sciences and Technology Division

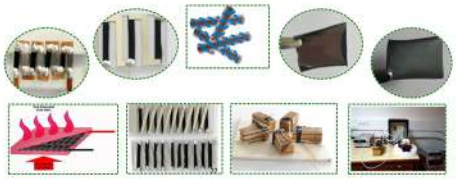
About CSTD

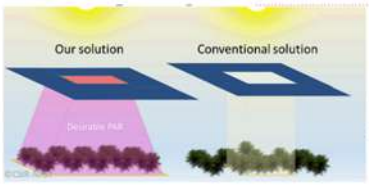
Chemical Science and Technology Divison (CSTD) at CSIR-NIIST Trivandrum is a hub of groundbreaking research and technology development. Notable achievements include the cost-effective synthesis of EIDD 2801 for COVID-19 treatment, innovative solutions for biomedical waste management, indigenization of solar module fabrication technology, and development of invisible fluorescent dyes to combat counterfeiting. Through these endeavours, CSTD demonstrates its commitment to advancing science for societal benefit, fostering self-reliance, and addressing critical challenges faced by developing societies.

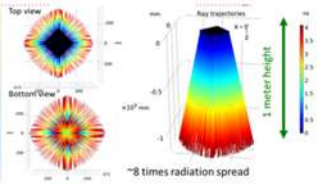
Various research programmes offered by the division are;











- Pioneering sustainable chemical synthesis methods to reduce environmental impact.
- Specializing in compound isolation, structure elucidation, and their applications in pharmacognosy.
- Advancing process development in structural chemistry and crystal engineering.
- Investigating formulations for both allopathic and herbal drugs in medicinal chemistry.
- Designing diagnostics and nanotheranostics for biomedical applications.
- Crafting versatile fluorescent materials for security, sensing, and therapeutic uses.
- Researching chromogenic materials for diverse industrial applications.
- Innovating in optoelectronics using organic and hybrid materials.
- Implementing efficient waste management solutions for pathogenic biomedical waste.
- Utilizing handheld Raman spectrometers and ultrafast spectroscopy for comprehensive material analysis.

The major characterization fascilities available in the division are;

Transmission Electron Microscopy (TEM)

Atomic Force Microscopy (AFM)

Gas chromatography/mass spectrometry (GC/MS)

Photoluminescence Spectroscopy (PL)

High-Performance Liquid Chromatography (HPLC)

Confocal microscope

Nuclear Magnetic Resonance Spectroscopy (NMR)

Centre for Sustainable Energy Technologies

About C-SET

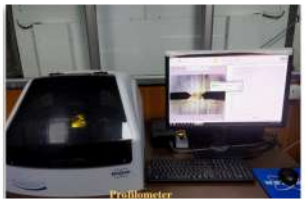
Centre for Sustainable Energy Technology (C-SET) is one of the newest additions to CSIR-NIIST Trivandrum with a vision to promote cutting-edge research and innovation in sustainable energy solutions. This centre aims to drive advancements in renewable energy, energy efficiency, and smart grid technologies, contributing to a greener and more sustainable future. C-SET fosters collaboration among experts from diverse fields such as Physics, Chemistry, Materials Science and Engineering.

Various research programmes offered by the divisions are;

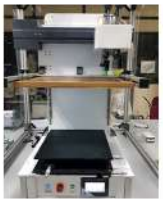
- Cost effective and indigenous fabrication of Perovskite and Dye sensitized Solar cells
- Innovations in OLED and OFET Fabrication Techniques
- Development of Electrochromic, Thermochromic and Thermoelectric materials and devices
- Excels in research related to Dye removal and Hydrogen technologies
- Stands out in electrochemical energy storage, electrocatalysis, and electrochemical sensing applications
- Materials for energy storage and conversion applications
- Working on technology development that aids dynamic light control for applications

Instrumentation Facility

Glove box



Profilometer



Screen printer

Parameter Analyzer

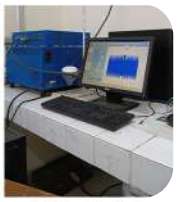
OLED J-V-L Measurement Setup

Chemical Vapour Deposition System

Glove box integrated with Thermal evaporation System

RF-DC Sputtering System

Spray-coating System



VMP3 Biologic Work Station

Crimbing machine

Probe Sonicator

TGA

CH Electrochemical Work Station

Dip coating System

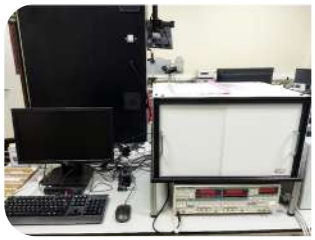
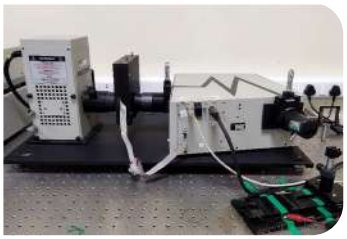


Photo-induced Absorption Spectroscopy (PIA)

Multipurpose Robot for DSC fabrication

Solar Simulator



Incident Photon to Current Conversion Efficiency (IPCE) Measurement System

ENVIRONMENTAL TECHNOLOGY DIVISION

About ETD

The environmental technology division develops innovative technologies for the management and mitigation of environmental pollution.

Research areas addressed

- Solid waste management : solid-state bio-methanation system for food waste management
- Wastewater treatment & monitoring : onsite modular biological treatment system for treating high strength waste water.
- Industrial odour and VOC control : g-BTF technology with low cost biofilter media for the treatment of odorous gaseous stream.
- Environmental impact assessment
- Environmental Toxicology : In vivo study using rat models and Eisenia fetida for environmentally relevant concentrations of toxicants.
- Environmental monitoring & remediation of toxic contaminants
- Environmental monitoring of Dioxins and POPs
- Health risk assessment : Risk assessment studies using PRISMA and metadata analysis
- Remote sensing and GIS applications
- Green hydrogen energy
- Ambient air quality monitoring

Facilities offered

- NABL-accredited facility for water and wastewater analysis (NABL TC-8086)
- Testing services for dioxin and PCBs in environmental, food and feed samples (NABL TC-8086)
- Stack emission monitoring
- Heavy metal analysis using ICP-MS
- Eco-engineering system for wastewater treatment
- River and replenishment studies (NABET)
- Environmental impact assessment in mining ports, harbours and breakwaters (NABET)
- Compact food waste bioenergy plant
- Modular onsite wastewater treatment system
- Clean bioprocess for extracting natural fiber
- Remote sensing and GIS
- Odour control biofilter system
- Biodegradability test for alternative to single use plastic
- Ecotoxicological services

Instrumentation Facility

Epifluorescent Microscope

Total Organic Carbon Analyser

Dynamic Olfactometer

Ion Chromatographic System

Inductively Coupled Plasma Mass Spectrometry

Continuous Flow Analyser

High-Performance Liquid Chromatography

Perchlorate Contaminated Water Treatment System

Grey Water Treatment and Recycle System

Onsite Wastewater Treatment and Resource Recovery Unit.

Liquid Chromatography-Tandem Mass Spectrometry

Gas Chromatography-Tandem Mass Spectrometry

Solid State Food Waste Bio-Energy Plant

Respirometer

Material Science and Technology Division

About MSTD

The Material and Technology Division of CSIR-NIIST pioneers interdisciplinary research in materials science, merging chemistry, physics, engineering, and biology. With advanced facilities, it explores a wide array of materials, from traditional to nanomaterials and composites. Committed to practical applications, the division develops sustainable materials, improves manufacturing processes, and creates advanced devices.

Research highlights

- Electronics, Electro-ceramics and Nano Ceramics
- Light weight metals, Alloys and composites
- Biopolymers and polymer nanocomposites
- Minerals, Exploration and Extraction

Recent researches

- Spray pyrolysis, Nano-structures; 2D materials & graphene
- Materials for hydrogen energy and capturing
- Engineered alloys for aerospace, automobile and strategic areas
- Rare earths, advanced ceramics, composites and ceramic pigments
- Multifunctional coatings, hybrid and ceramic phosphors
- Piezo-Nano-Tribo generators, LTCC ceramics, conducting inks and EMI shielding materials.
- Semi conducting materials, Magnets and printed electronics
- Bio-resins, Bio-polymers, Polymer aerogels, Green packaging materials and natural fibre reinforced composites
- E-waste processing and extraction of critical materials
- Computational material science

Major facilities in the department

Scanning Electron Microscope (SEM)

X-ray Diffraction (XRD)

Fourier Transform Infrared Spectroscopy (FTIR)

Electrospinning Unit

Contact angle measurement

X-ray Photoelectron Spectroscopy (XPS)

Impedance analyser

WAXS

The Physical Properties Measurement System (PPMS)

Polarization Microscope

Microbial Processes and Technology Division

About MPTD

The Microbial Processes and Technology Division (MPTD) of CSIR NIIST stands as a pioneering research hub dedicated to advancing microbial processes and fermentation technologies. Integral to India's biofuel missions, such as the PANCSIR program on 2G ethanol, MPTD spearheads efforts to implement cost reduction strategies, aiming for low-cost second-generation ethanol production. The division boasts the establishment of an Integrated 2G ethanol pilot plant, a significant milestone in nationwide ethanol research initiatives. MPTD's expertise spans a wide spectrum, encompassing genetic engineering, bioprocess development, algal studies, plant-microbe interactions, membrane biophysics, and biopolymer production. With a steadfast commitment to innovation and access to advanced instrumentation facilities, MPTD provides a dynamic environment for scientists and researchers to explore novel avenues in microbiology and biotechnology, contributing significantly to scientific advancement and sustainable solutions.

Research Highlights

- **Biofuel:** The PANCSIR program on 2G ethanol is coordinated by NIIST, aimed to reduce the cost of 2G ethanol production to < Rs 100/L.
- **Genetic Engineering:** Metabolically engineered strains were created to produce high value secondary metabolites.
- **Bioprocess Development:** Development of a bioprocess for Gibberellic acid (GA3), 2,3-butanediol, 2,5-Furandicarboxylic acid (FDCA) from 5-hydroxymethylfurfuraldehyde (HMF) and indigenous starter culture consortia for dairy products.
- **Algal Studies:** Research on stress-induced oil accumulation in microalgae.
- **Plant microbe interaction:** A novel plant-associated rhizobacteria strain was identified for salinity stress alleviation from Pokkali rice.
- **Biopolymer production:** Polyhydroxy butyrate production using used cooking oil was demonstrated at lab scale with a yield of 3.8g/L.
- **Membrane biology:** Studies on synthetic membrane vesicles and creating functional artificial cells that mimic microorganisms.

Major facilities in the department

Integrated 2G ethanol pilot plant

One of the initial 2G ethanol pilot plants established nationwide. Operating with a capacity of 80 kilograms of biomass per batch

Solid State Fermentation (SSF)Pilot Plant (Koji Room)

SSF pilot plant has the capacity to operate 100 production scale trays (~50kg moldy bran per batch).

Fermentation facility

Fermenters ranging in volume from 0.5L capacity to 20L.

Instrumentation Facility

Gas Chromatograph- Mass Spectrometry (Shimadzu)

High-performance liquid chromatography (Shimadzu)

Gas Chromatography (Shimadzu)

Applied Biosystems 3500 Genetic Analyzer

Ultracentrifuge (Beckman Optima)

Fourier Transform Infrared Spectroscopy (Shimadzu)

Multimode Fluorescence reader (Tecan)

Epifluorescence microscope (Carl Zeiss)

Gel Documentation System (Biorad-Chemidoc)

From the Placement Cell Desk

CSIR-NIIST is dedicated to creating and advancing technology for the betterment of humanity. With almost five decades of experience, we have continuously adapted to offer a comprehensive learning experience and exposure to our students. We understand the demand for skilled professionals in today's global and dynamic industries. Our interdisciplinary research programs equip students with the necessary skills to excel in various work environments. Take a closer look at our research programs and witness the capable and talented individuals who are poised to lead technological progress to new horizons.

Team

Coordinator:

Dr. Rakhi R.B.

Principal scientist, Centre for sustainable Energy Technologies

Help Desk Executive:

Mrs. Anila G.K.

Student Team Lead:

Mr. Amarjith V Dev

Team Members:

Renjimol R, Soumya Mohan I, Sayoojya Sathyan, Vipin C.K, Amarjith A.V, Abhilash T.K, Mohammad Shehbas C & Kavya Mohan

CSIR-NIIST PLACEMENT CELL TEAM

Contact us:
placementcell@niist.res.in : Phone: +91-471-2515411