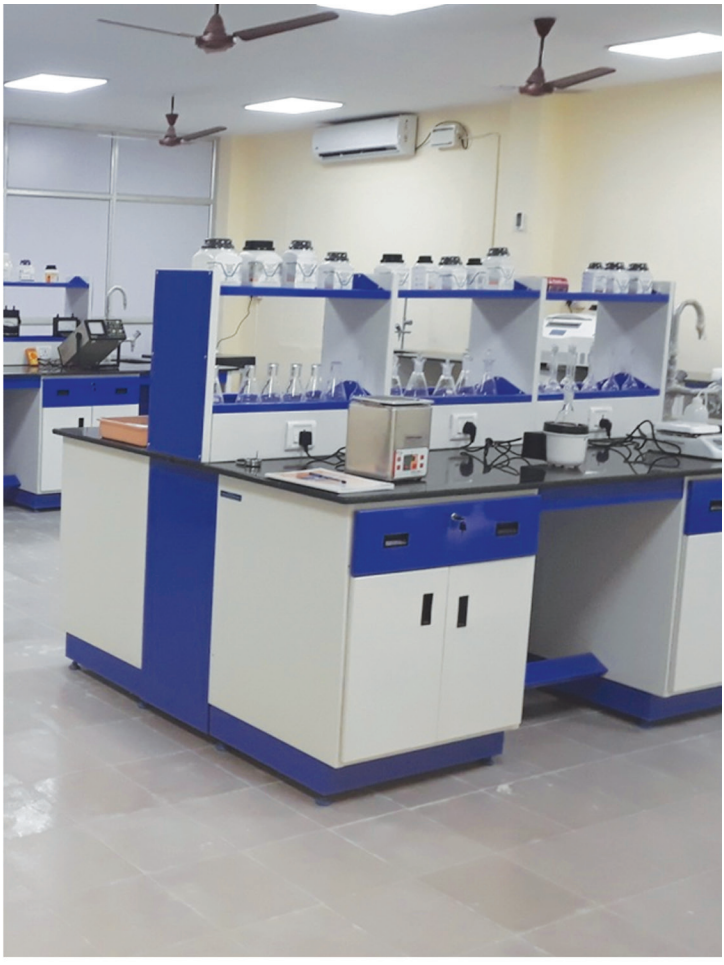

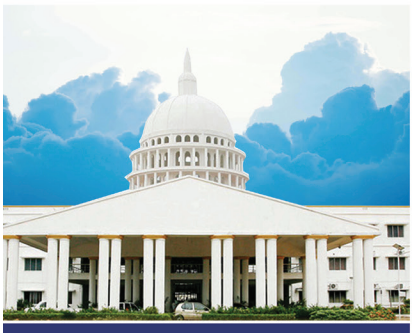

CENTRE FOR NANOTECHNOLOGY RESEARCH

AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY
(An Constituent College of Vinayaka Mission's Research Foundation)

VINAYAKA MISSION'S RESEARCH FOUNDATION
(Deemed to be University under section 3 of the UGC Act 1956)

Accredited by NAAC

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Centre for Nanotechnology Research

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PAIYANOOR – 603 104

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Centre for Nanotechnology Research

About the Centre

Centre for Nanotechnology (CNR) was founded in January 2018 at Aarupadai Veedu Institute of Technology to accelerate R & D activities in various nano engineering fields. Currently, the research centre CNR operates a state-of-the-art research program in the field of nanomaterials, nanoporous materials, nanocoatings and thin films supported by cutting edge facilities for materials synthesis and characterization.

Vision

To provide an inter-disciplinary research platform for R & D in emerging fields of Nanotechnology.

Mission

- Create infrastructure for Research and Development in “Nanoscience and Nanotechnology”
- Develop a wider range of engineering products
- Promote application oriented Research
- Provide excellent customer services and support
- Establish national and international collaborations
- Mobilize funds from various funding agencies
- Transfer technology and knowledge to industrial sector that meet international standards

Current Research Topics

- Nanoparticles
- Nanoporous and Nanostructured bulk materials
- Biotechnology and Biomedicine
- Nanostructured thin films and coatings
- Functional and structural nanomaterials
- Electrical, optical and magnetic materials and Photovoltaic devices
- Super capacitors, Fuel cells and Batteries
- Tissue Engineering and Bone grafting
- Corrosion and Surface engineering
- Materials with high yield strength and hardness

Experimental synthesis and characterization facilities available at the centre are:

- Atomic Force Microscope
- Fourier Transform Infrared (FTIR) spectrometer
- UV-Visible spectrophotometer
- Fully equipped Sol-Gel laboratory
- Fully equipped wet-chemical laboratory
- Workstation facility for the preparation of electrodes and photovoltaic devices

- Fume Hood
- Water purification system
- Centrifuge unit
- Ultrasonic bath
- Sample homogenizer
- Digital hot plates
- Digital Balance
- Resistive heating muffle furnace

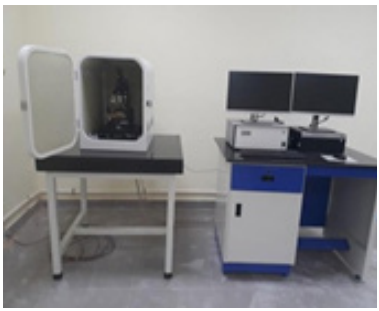
Facilities under procurement

- Powder X-ray diffractometer
- Electrospinning Apparatus
- Sputter Thin film deposition systems (DC/RF)
- Electrochemical Workstation
- Physical property measurement system
- Hardness Tester
- Field Emission Scanning Electron Microscope with EDX attachment
- Hydraulic Press

"Specifications and description of the equipment's available at the Centre"

Atomic Force Microscope (Park XE7 AFM):

Park XE7 Atomic force microscope AFM is a surface mechanical property measuring tool designed to be used for measuring surface features of dimensions between 10 nanometer and 100 μm. It provides valuable information about three - dimensional topography as well as physical properties of sample surfaces.



Park XE7 AFM set-up

The basic principle of the atomic force microscopy technique is to measure the forces or interaction between the probing AFM tip and the sample surface. The technique is also used to characterize electrical, magnetic, morphological and mechanical surface properties in real space on atomic scale.

AFM modes available are: True contact mode, Non-contact mode, tapping mode

Specifications:

XY Scanner
Single-module flexure XY scanner with closed-loop control

Scan range: 100 μm x 100 μm
50 μm x 50 μm
10 μm x 10 μm

Z Scanner range

Guided high-force Z scanner

Scan range : 12 μm
: 15 μm

Manual Stage

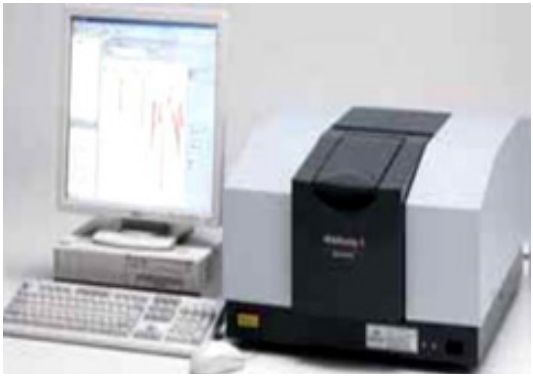
XY travel range : 13 × 13 mm
Z travel range : 29.5 mm
Focus travel range : 70 mm

Typical AFM resolution: X-Y: 1 nm; Z: 0.1nm;

Detection: sub-Å deflection, pN forces

Fourier Transform Infra-Red spectrometer:
(Model: IR affinity with single reflection ATR)

Shimadzu make Fourier transform Infra-red (FTIR) spectrometer (model: IR affinity IS) coupled with attenuated total reflection (ATR) is a sophisticated compact instrument designed to be used for a wide range of structural analysis.



Shimadzu Multi purpose IR affinity FTIR

ATR is a sampling technique used in conjunction with infrared spectroscopy which enables samples to be examined directly in solid state or in liquid state without further preparation. The surface emitted IR spectrum recorded from the bond natural vibration frequencies provides knowledge about the presence of various functional groups and chemical bonds present in the sample. The spectrometer offers high signal to noise ratio (30,000 : 1) or higher. Despite its compact design, it offers full functionality for all FTIR techniques, including transmission and diffuse reflection.

Specifications:

Interferometer : Michelson interferometer (30° incident angle) Equipped with Dynamic Alignment system Sealed interferometer with auto dryer

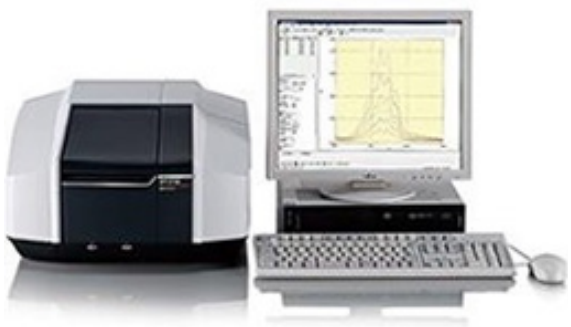
Beam splitter : Germanium-coated KBr
Light source : High-energy ceramic light source
Detector : DLATGS detector equipped with temperature control Wave number range: It operates in full mid-IR range from 7800 cm-1 to 350 cm-1.

Resolution : 0.5, 1, 2, 4, 8, 16 cm^{-1}
Dimensions : 514 (W) x 606 (D) x 273 (H) mm
Weight : 35 kg

UV - Visible Spectrophotometer:

UV-Visible spectrophotometer (UV-Vis 2600, Shimadzu make) is an analytical tool used to measure the optical properties of the samples in the UV-visible range of the electromagnetic radiation. It is the most widely used spectrometer for studying liquid medium, gas and solids including semiconductors, films, glass and absorbing materials. Importantly, the UV-Visible spectrometer determines how much light of a given wave length or frequency passes through a sample and how much is absorbed.

The frequency or wavelength at which the light is absorbed or emitted depends on the nature of the electronic transition energy levels present.



Shimadzu UV-Visible spectrophotometer

The optional facility of ISR-2600 plus integrating sphere attached with the main unit enables to measure absorbance or emission spectral features in a wider wavelength range 220 - 1400 nm.

As a result, UV-Vis 2600 can accommodate measurements of solar cell anti-reflective films and polycrystalline silicon wafers.

Specifications	
Wavelength Range	185 to 900 nm or 220 to 1400 nm (when the ISR-2600 plus Integrating sphere attachment is used)
Optical System	Double beam, Single mono-chromator
Resolution	0.1 nm
Wavelength Accuracy	+/-0.1 nm (656.1 nm D2), +/-0.3 nm (all range)
Scanning Speed	4000 to 0.5 nm/min
Spectral Bandwidth	0.1, 0.2, 0.5, 1, 2 or 5 nm
Light Source	50 W Halogen lamp, Deuterium lamp

Powder X-ray Diffraction Set-up:
(The procurement of this instrument is in progress)

Powder X-ray diffractometer (X'pert3) is the newest diffraction system operating on the fully renewed X'Pert platform. It is used primarily for structural analysis of materials of different forms viz., powder, porous, thin and thick films, sintered pellets.

X'pert3 Powder XRD

It is one of the non-destructive tools used for the identification of crystal structure, unit cell dimensions, crystallite size, crystal strain, phase purity, chemical composition, texturing and mechanical deformation, crystal orientation, etc.

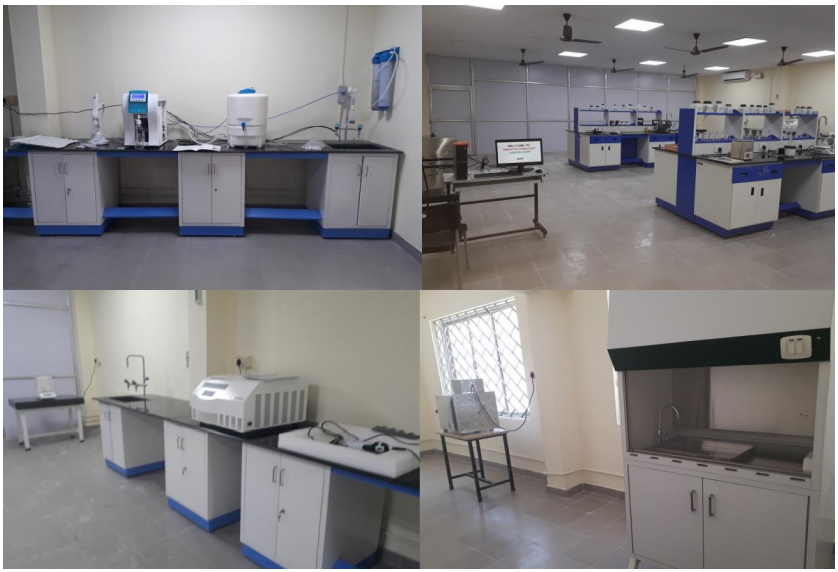
Features:

- High speed high quality data
- Up to five times faster than bench-top systems
- Multiple options for added applications
- Automatic sample change option

- Comprehensive, easy - to - use software
- Enclosure Dimensions :
  1370 (W) x 1131 (D) x 1972 (H) mm

Synthesis Laboratory:

The photo view of the nanomaterials synthesis laboratory is shown below



Interdisciplinary Faculty Team

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S. No.:	Name of the members	Designation / Department	E-mail ID / Mobile
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21	Dr. B. Govindaraj	Assistant Professor in Chemistry, FAS	seenuchemist@gmail.com 98659 60781
22	Dr. K. Ramamurthy	Visiting Professor, AVIT	ramamurthy.biomedical@avit.ac.in 94990 09516
23	Dr..R. Subbaiya	Associate Professor Department of BT, AVIT	subbaiya@avit.ac.in 97899 31379

Project Proposals Submitted/Sanctioned

- UGC-DAE CSR: Investigation of defects induced microstructural changes in three- dimensional topologically complex morphology in nanoporous Au-Pd (sanctioned).
- DBT ATGC - Application of computer data analytics in agriculture for improved crop production (submitted).
- ICMR-Task force Synthesis & Characterization of metal nanoparticles decorated ZnO nanorods array for nano - biosensors in detection of different diseases using bio-analyte (submitted).

Academic Programmes offered

- B.E Nanotechnology
- Ph.D - Regular

Collaborating Institutions

Collaborations from National Academia Institutions

- IITM, Chennai
- INUP, CeNSE, IISC Bangalore
- National Institute of Technology, Trichy
- Chennai Academy of Sciences
- University of Madras

- Bharathidasan University
- Anna University
- Central University, Pondicherry

Collaborations from National R & D institutions

- Indira Gandhi Centre for Atomic Research (IGCAR)
- UGC – DAE CSR, Kalpakkam Node
- ARCI, Chennai
- CSIR - CGCRI, Kolkata

International collaborations from Academia

- Institute of Nanotechnology, KIT, Germany
- Technical University of Hamburg, Germany
- University of Saskatchewan, Canada

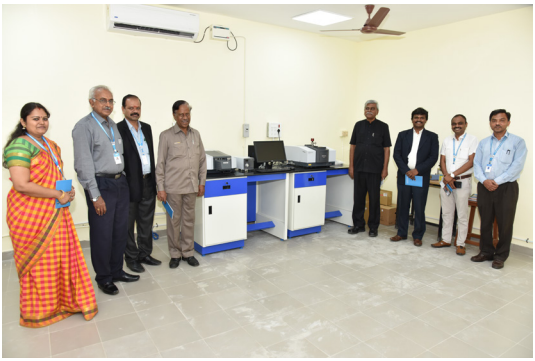
Patent Filed

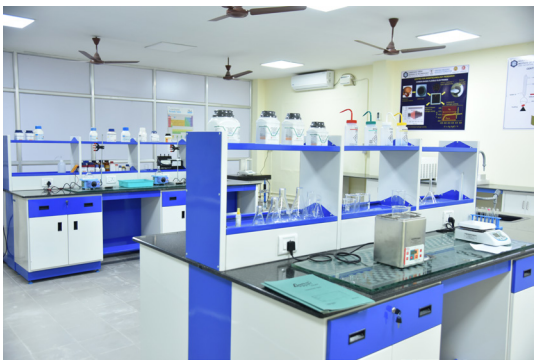
- Nanocarbon based highly flexible electrodes for energy storage devices
- Heterojunction Single Electron Transistor

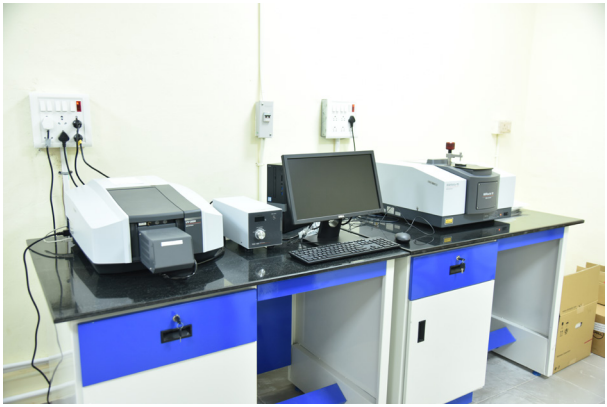
Contact Person

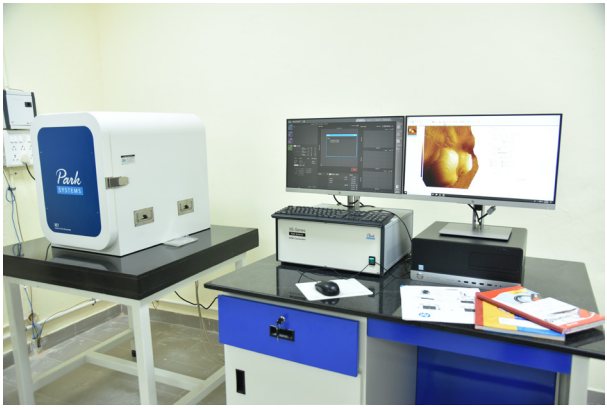
Dr. R. N. Viswanath
Co-ordinator
Centre for Nanotechnology Research (CNR)
Mobile: 9362625622

Research Centre Photo View





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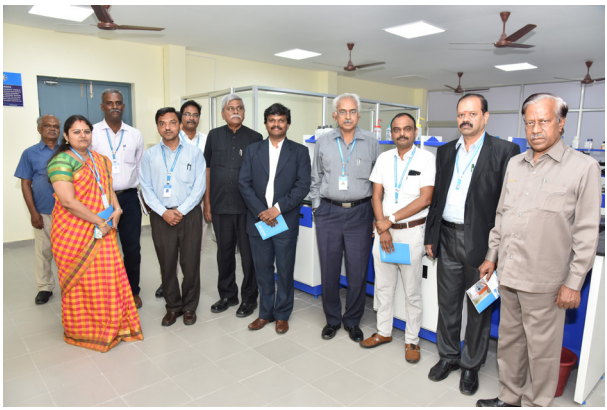

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