UPES

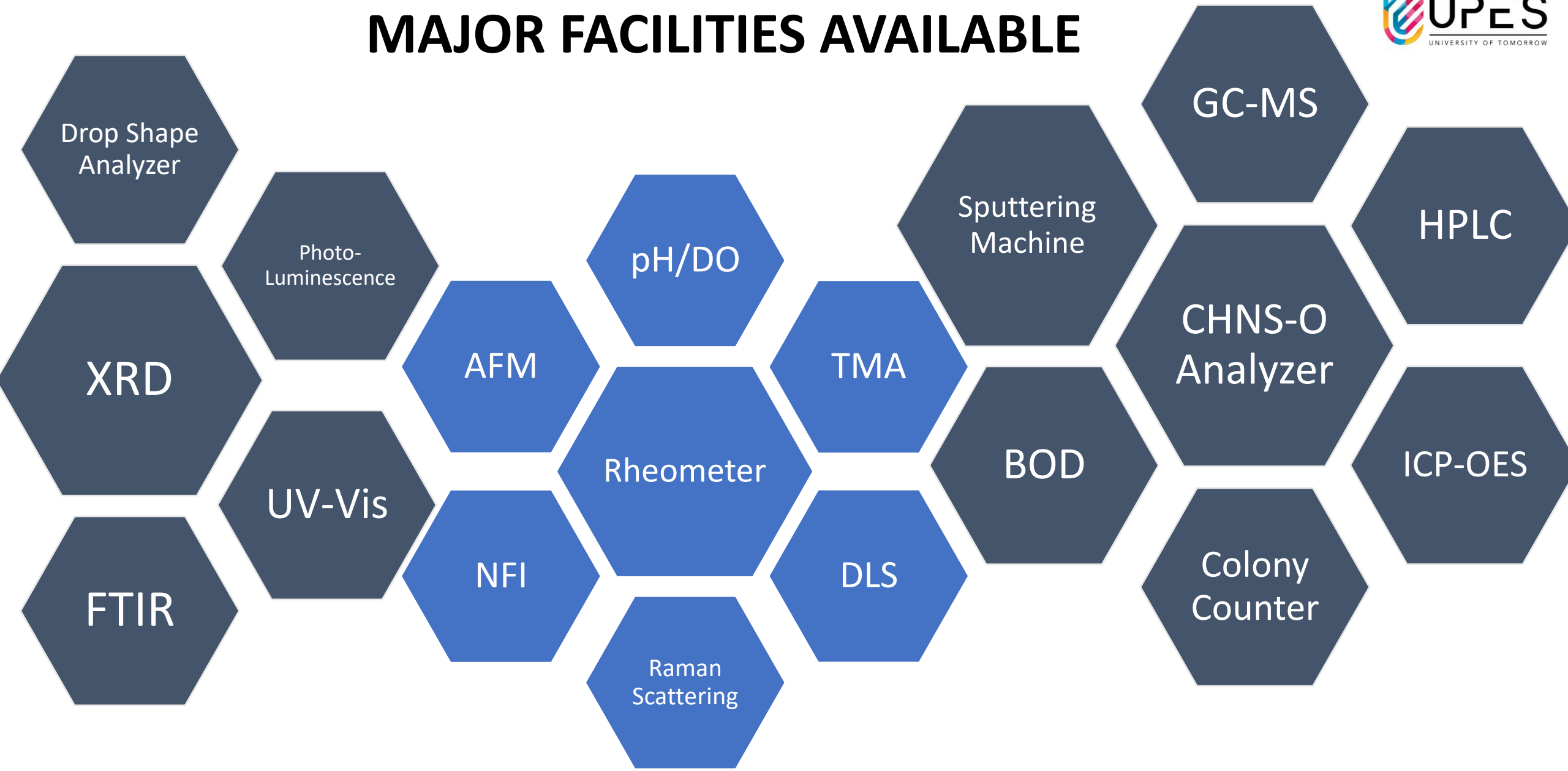
CENTRAL INSTRUMENTATION CENTER

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
DEHRADUN, UTTARAKHAND

Central Instrumentation Center (CIC) was inaugurated by

"Padma Bhushan Dr. R. Chidambaram" on 27th February 2014. This facility is aimed to provide data collection from sophisticated, analytical equipment's to scientific community for their advanced research and also to facilitate cutting edge technologies for your needs.

MAJOR FACILITIES AVAILABLE



FT-IR (Frontier FT-IR/FIR, Perkin Elmer)

- Detection of Functional groups and characterizing co-valent bonding information.
- Stretching and Bending vibrations of organic compounds
- Support in Identification of components in a mixture of components.
- Provide information about structure of material.
- Understanding the unknown contaminants in industrial samples.

XRD (D8 ADVANCE ECO - Bruker)

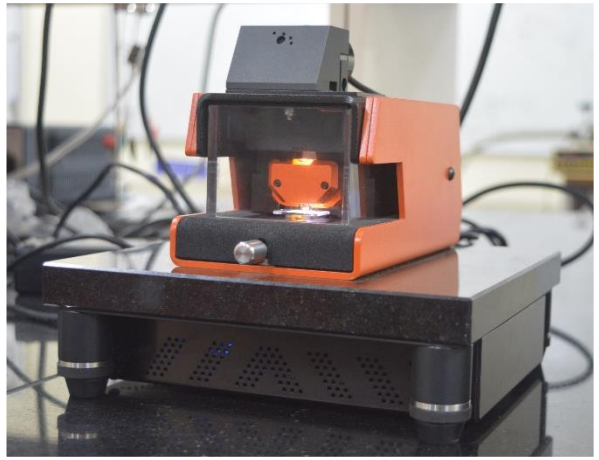
- Non –destructive techniques to identify crystalline phases and orientation.
- To determine structural properties: strain, grain size, epitaxy, phase composition, ordered disordered transformation, thermal expansion etc.
- To determine crystalline and amorphous arrangements.
- Measurement of thickness of layers
- Determination of texture of poly grained material

Spectro Photo meter UV-Vis (LAMDA 35, Perkin Elmer)

- Determination of metal and organic non-metal analytes in water
- Characterization of petrochemical Products
- To generate quick and easy methods for common food analyses without the need for extensive training ensuring that the correct results are reported without compromising food quality.
- High optical quality for environmental analysis.

Atomic Force Microscope (NANOSURF AG)

- Image of material surface at atomic resolution.
- Determine the roughness of surface samples and measure the thickness of crystal growth.
- Imaging of non-conductive biological surfaces.
- Applicable for quantification of abrasion, adhesion and corrosion of surfaces.



CHNS-O Analyzer (Flash 2000 Series, Thermo Scientific)

- To analyse organic CHNSO composition of the solid and liquid samples from 0.01 to 100% using TCD.
- To analyse trace level sulphur up to 25 ppm using FPD
- Organic CHNSO composition of solid and liquid samples such as biomass, bio-oil, liquid and solid fuels.
- Provide information about structure of material.
- Predicting theoretical calorific value from the CHNSO composition of the sample.

ICP-OES (Plasma Quant 9000- Analytikjena)

- Direct Analysis of Saline Matrices.
- Composition Analysis of an Electrolytic Etching Solution.
- Specification Analysis of Gasoline.
- Trace Metals Analysis in Water-Methanol-Oil Mixtures.
- Analysis of Rare Earth Elements in Granite and Sandstone.
- Analysis of High-alloyed Steel.

Contact Angle Goniometer/Drop Shape Analyzer (DSA25, Kruss)

- Characterization of surface pre-treatment processes
- Investigation of the adhesion and stability of bonding and coating processes
- Investigation of coating substances in accordance with DIN 55660
- Checking the wettability of plastic, glass, ceramic, wood or metal
- Quality control for wafers and microelectronics

Nano fluid interferometer (Mittal Enterprises-NF10)

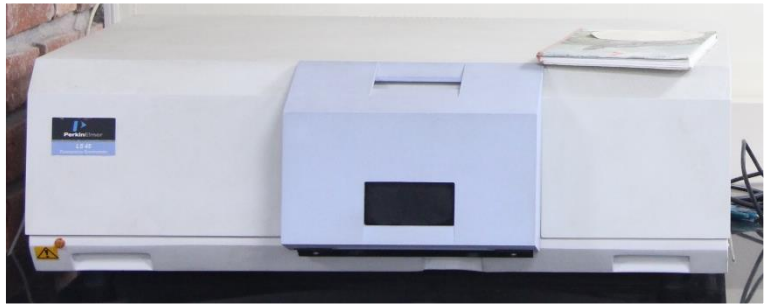
- Characterization of Nanofluids like Ag/Au & Ferrofluids etc.
- To evaluate modest nanoparticles concentration in the fluid for significant enhancement of its property.
- Prediction of enhanced thermal conductivity due to suspension of the metallic nanoparticles with very low concentration in to the polymeric fluids.
- Sound Velocity and compressibility of nanoparticles with liquid suspension.
- Study of Phase transition and to detect/assess weak and strong molecular interactions in Nanofluids.
- To determine the extent of complexation and calculate the stability constants of such nanofluid complexes.

Particle size analyzer (ZEN1690, Malvern Instruments Ltd, 2013)

- For solids, the surface area of the particle is critical in determining the rate of chemical reaction.
- Particle characterization analyzers have found uses in quality control, process material evaluation, and research and development for applications.

Photoluminescence Spectrophotometer (LAMBDA 45, Perkin Elmer, 2013)

- Quantification of heavy metals (nanomaterials) in freshwater, seawater, air, and soil.
- Soil contamination from organic materials.
- Sunscreen efficacy.
- Water and wastewater analysis.

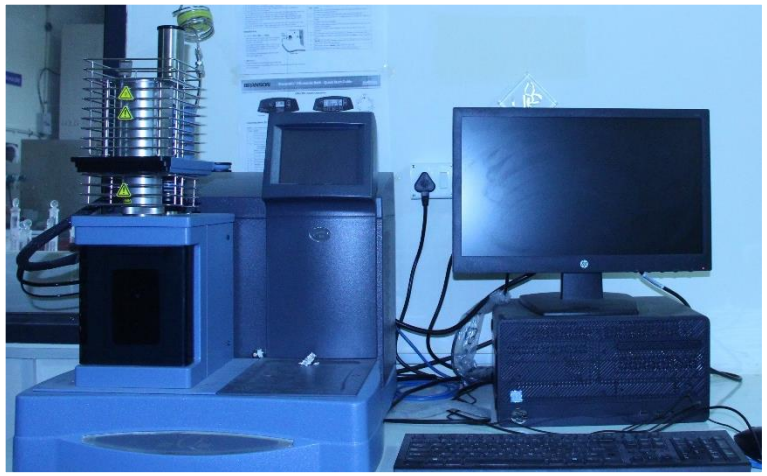


Potentiostat-Galvanostat (CHI660E, CH Instruments, USA, 2013)

- General purpose electrochemical measurements
- Kinetic measurements
- Electroanalysis
- Fundamental research
- Corrosion
- Battery studies.

Rheometer (Model C-LTD80/QC, Anton Paar GMBH,Austria, 2013)

- Viscosity measurement – From single point up to complex rheological tests
- Quick and accurate temperature control
- Ease of operation for single-point viscosity determinations as well as more sophisticated rheological tests
- A wide range of applications covered by only one rotational rheometer
- A broad variety of measuring systems and accessories for a multitude of applications



Thermo mechanical Analyzer (TA Instruments-TMAQ400EM)

Intrinsic and product property measurements

- Accurate Co-efficient of Thermal Expansion
- Material performance
- Multilayer film analysis
- Shrinkage force testing
- Film tensile
- Fiber stress/strain measurement
- Thermal stress analysis fibers

GC-MS (CLARUS SQ8S, Perkin Elmer)

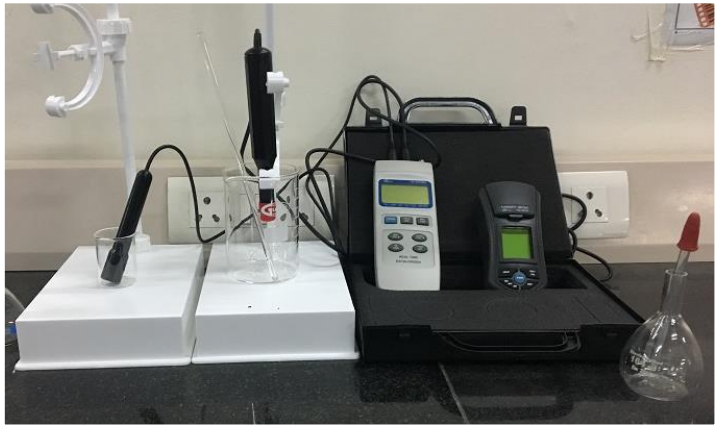
- Test for contaminants and quality in food, flavors and fragrances
- Monitor for VOCs and SVOCs in air, water and soil
- Ensure quality of consumer goods, including plastics
- Analyze lubricants for quality and conformity
- Meet global regulatory requirements
- Gain efficiencies in sample handling through an autosampler.

ISE Measurements (Orion Dual Star, Thermofisher)

- Quantification of
  - Monovalent cations and anions such as Fluoride, Nitrate, Nitrite, Ammonium etc.
  - Divalent cations and anions such as Copper, Lead etc.

pH/ORP, DO, CD/TDS, Turbidity Meter (YK-2005WA, TU-2016, Lutron)

- One meter for multi purpose operation :PH/ORP, DO, CD/TDS METER
- pH : 0 to 14.00 pH, ORP : ± 1999 mV.
- Conductivity : 200 uS/2 mS/20 mS/200 mS.
- Dissolved oxygen : 0 to 20.0 mg/L.
- Turbidity: 0.00 to 50.00 NTU, 50 to 1,000 NTU



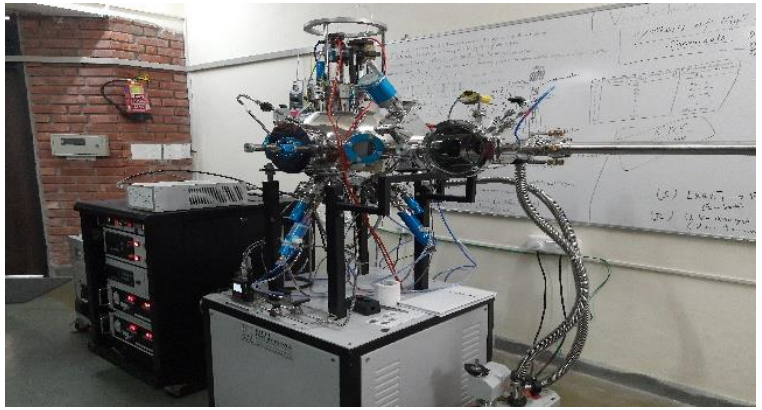
HPLC (Prominence I series, Shimadzu)

• High injection precision for precise quantification, and exceptional retention time repeatability aid in accurate peak identification

• Detection capabilities include photodiode array, refractive index

Colony Counter (SCAN 4000, Interscience)

- Ultra HD automatic colony counter
- Inhibition zone reader for reading of colonies
- Higher accuracy and compactible with all sizes of petri dishes and media
- Digital zoom x 69
- Resolution: 5 megapixels
- Counting time: up to 1000 colonies per second



SPUTTERING SYSTEM (Excel Instruments)

Thin antireflection coatings on glass for optical applications are also deposited by sputtering. Because of the low substrate temperatures used, sputtering is an ideal method to deposit contact metals for thin-film transistors. Another familiar application of sputtering is low-emissivity coatings on glass, used in double-pane window assemblies. The coating is a multilayer containing silver and metal oxides such as zinc oxide, tin oxide, or titanium dioxide. A large industry has developed around tool bit coating using sputtered nitrides, such as titanium nitride, creating the familiar gold colored hard coat. Sputtering is also used as the process to deposit the metal (e.g. aluminium) layer during the fabrication of CDs and DVDs.

Raman Scattering

- *based on the Raman scattering where the lower frequency photons are pumped to a high-frequency regime with a surplus amount of energy.*
- *works on the basis of Raman effect and finds applications in various fields like in nanotechnology to understand the structure of nanowires, in biology and medicine where the low-frequency DNAs and proteins are studied and chemistry to understand the structure of molecules and their bonds.*
- *used in remote sensing and planetary exploration.*
- *used to sense the minerals in Mars.*

Areas of Expertise

Biofuel

- Additives Development and Testing
- Endurance Analysis
- Blending optimization
- IC Engine Research
- Plastic waste to Fuel
- Waste to Fuel
- Algal based Biofuel
- And related areas

Solar

- Plant Design
- Pyrolizers
- Cooling Devices
- Efficiency Analysis
- Measurements
- And related areas

Water

- Treatment
- Shedding
- Management
- Treatment Plant
- Sludge Management
- Development of Filtration Units
- Development of Adsorbents
- Cost Effective Water Treatment Devices
- And other related areas

Energy

- Auditing
- Optimization
- Analysis
- Modelling
- And related areas

Management

- Supply Chain
- Policy Frameworks
- Sustainability

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Contact Us:
Dr. Devesh Kumar Avasthi,
Dean- R&D,
Central Instrumentation Center, University of Petroleum and Energy Studies, Bidholi, Dehradun, Uttarakhand-248007
Email: upescic@upes.ac.in
Web: www.upes.ac.in; www.research.upes.ac.in
Ph: 0135-2770137 Extn: 1595