UNIVERSITY OF AGRICULTURAL SCIENCE RAICHUR

CENTRE FOR NANOTECHNOLOGY

(ISO 9001:2015 CERTIFIED LABORATORY)

Rastriya Krishi Vikas Yojana (RKVY), Government of Karnataka and University of Agricultural Sciences, Raichur is kind enough to extend the financial support to create the infrastructure on application of nanotechnology in agriculture to enhance the quality of agricultural produce. A separate well equipped laboratory on **"Centre for Nanotechnology"** was established at University of Agricultural Sciences, Raichur, Karnataka.

Brief of the Nanotechnology

Nanotechnology is a science which includes chemistry, materials science, engineering, physics, biosciences, medicine, environmental and agricultural sciences. Nanotechnology deals with the manipulation of atoms, molecules, or molecular clusters into functional structures to create functional materials and devices of vastly different properties. The first use of the concept of 'nanotechnology' was in "There's Plenty of Room at the Bottom", a talk given by the physicist, brain child of late Nobel laureate Richard Feynman in 29th December, 1959. Now a nanotechnology does not remain as a theoretical science rather it is being applied in all fields and gained the status of applied science and it is a

multidisciplinary subject. Agriculture and Food Production are no exception to it. Hence, “The Next Big Thing is Very Small .....”

Most definitions revolve around the study and control of phenomena and materials at length scales below 100 nm and quite often they make a comparison with a human hair, which is about 80,000 nm wide. A nanometer is one-billionth of a meter. A sheet of paper is about 100,000 nanometers thick; a single gold atom is about a third of a nanometre in diameter. Dimensions between approximately 1 and 100 nanometres are known as the Nano scale. Unusual physical, chemical, and biological properties can emerge in materials at the nano scale. These properties may differ in important ways from the properties of bulk materials and single atoms or molecules.

A nanometer (nm) is one thousand millionth of a meter. For comparison, a red blood cell is approximately 7,000 nm wide and a water molecule is almost 0.3nm across. To see where 'nano' fits on the scale of things with examples: View the Milky Way at 10 million light years from the Earth. Then move through space towards the Earth in successive orders of magnitude until you reach a tall oak tree. After that, begin to move from the actual size of a leaf into a microscopic world that reveals leaf cell walls, the cell nucleus, chromatin, DNA and finally, into the subatomic universe of electrons and protons.

The design, characterization, production, and application of structures, devices, and systems by controlled manipulation of size and shape at the nanometer scale (atomic, molecular, and macromolecular scale) that produces structures, devices, and systems with at least one novel/superior characteristic or property.

Nanotechnology is helping to considerably improve, even revolutionize, many technology and industry sectors: information technology, homeland security, medicine, transportation, energy, agriculture and allied science, food safety, and environmental science, and among many others.

Many benefits of nanotechnology depend on the fact that it is possible to tailor the structures of materials at extremely small scales to achieve specific properties, thus greatly extending the materials science toolkit. Using nanotechnology, materials can effectively be made stronger, lighter, more durable, more reactive, more sieve-like, or better electrical conductors, among many other traits.

Objectives of the Centre

- Synthesis and characterization of nano materials
- Studies on nutrient based nano food product.
- Studies on analytical methods and monitoring of their release characteristics of insecticides from encapsulated forms in controlled atmosphere.
- Studies on nano material based purification for improving the quality of water.
- Development of nano based moisture barrier biodegradable packaging Material.
- Development of nano based filter for dairy plant effluent treatment.

Major achievements of the Centre for Nanotechnology, CAE, Raichur during last six years (2012-2019)

I. No. of PG/Ph.D. students worked at the Centre for Nanotechnology for the research work

1. M. Tech/M.Sc. students -27
2. Ph.D. students - 09

II. Regular Schemes/Projects being operated in the Centre for Nanotechnology

1. Centre for Nanotechnology funded by UAS Raichur

III. Ad-hoc projects/schemes being sanctioned and being operated in the Centre for Nanotechnology

1. RKVY on Nanotechnology
2. Revolving Fund

IV. Technologies recommended/Accepted for inclusion in Package of Practices.

A. 2015-16

1. Nano water purification system.

B. 2016-17

1. Nano encapsulation of probiotic bittergaurd juice powder

C. 2018-19

1. Development of chitosan based nanocomposite packaging film.

D. 2019-20

1. "Modelling and simulation of eco-friendly nano – composite based dispenser

V. No. of Publications in the National/International Referred Journals: 38

2011: 01

2012: 01

2013: 01

2014: 01

2015: 01

2016: 03

2017: 10

2018: 08

2019: 12

2020: 01

Patents granted/applied – 03

1. Development of Chitosan Zinc Oxide Nano adsorbent coated sand filter bed for dairy industry waste water treatment - 201941005538A
2. Chitosan graphene oxide coated sand filter bed for the removal of phosphate from wastewater and a method thereof – 201941025276A.

3. Chitosan iron oxide coated sand filter bed for adsorption of sulphate and nitrate form milk processing industrial wastewater and a method thereof - 201941025291A.

VI. Popular articles and extension leaflets- 03

VII. Curricula developed:

A course on NST 501 (1+1), Nano science and Technology and its applications.

VIII. International visits/conference attended abroad- 05

IX. Awards/recognition-10

X. External funding

2012-13: 50.00 lakhs

2013-14: 100.00 lakhs

2014-15: 169.00 lakhs

2015-16: 65.00 lakhs

2016-17: 65.00 lakhs

2017-18: 172.00 lakhs

2018-19: 125.00 lakhs

2019-20: 200.00 lakhs

XI. Regular Schemes/Projects being operated in the Centre for Nanotechnology

1. Centre for Nanotechnology funded by UAS Raichur (Ab. Ac. No. 6035)

Amount:

2016-17**:** 26, 57.000/-

2017-18: 30, 50.000/-

2018-19: 31, 80,000/-

2019-20: 27,10,900/-

2. Revolving Fund (Ab.Ac.No. 8633)

Total Amount collected: □ .8,13,225/-

XII. Training programme conducted – 1 No

Application of nanotechnology in food and agriculture

6 days (14.10.2019 to 19.10.2019) – **25 members**

Facilities available and services being offered

- Physical / Chemical / Biological synthesis laboratory
- Characterization laboratory viz., Particle size analysis, Scanning Electron Microscope – Element Detection Sensor (SEM-EDS), Atomic Force Microscope, X-Ray Diffraction, UV-Spectra fluorescence reader, Gas Chromatography- Mass spectrophotometer, High pressure homogenizer, Ultra sonic spray dryer, Freeze Dryer, Electro static spinning, Liquid dispenser, High energy ball milling, Ultra centrifuge, FT-IR, Raman Spectroscopy.
- Water purification laboratory viz., Arsenic purification
- Capacity building for stake holders, educating UG and PG students. A separate course on Nano Science and Technology and Its Applications – NST 501 (1+1).

Research accomplishments

- Formulation and release characteristics of insecticides in controlled atmosphere
- Encapsulation of nano materials
- Water purification for heavy metal removal viz., Arsenic removal.

For Further Details Contact

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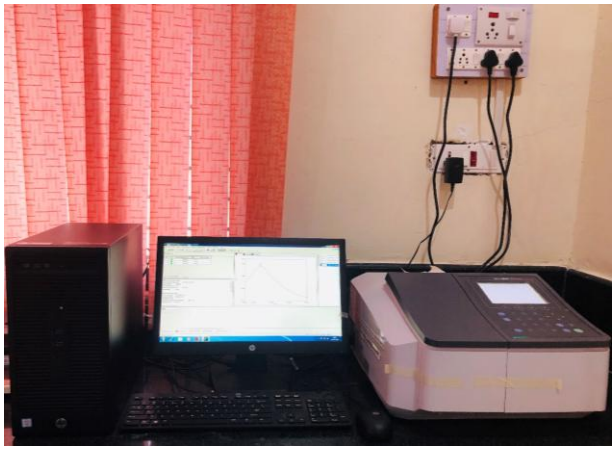
CENTRE FOR NANOTECHNOLOGY (ISO 9001 CERTIFIED)

Synthesis Laboratory

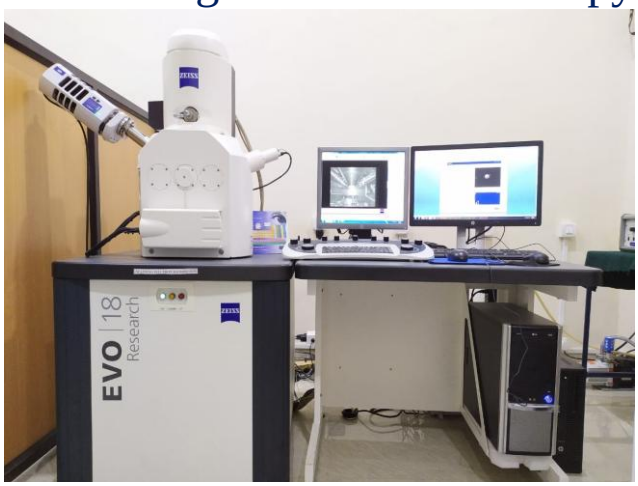
Characterization Laboratory

UV–Spectrophotometer



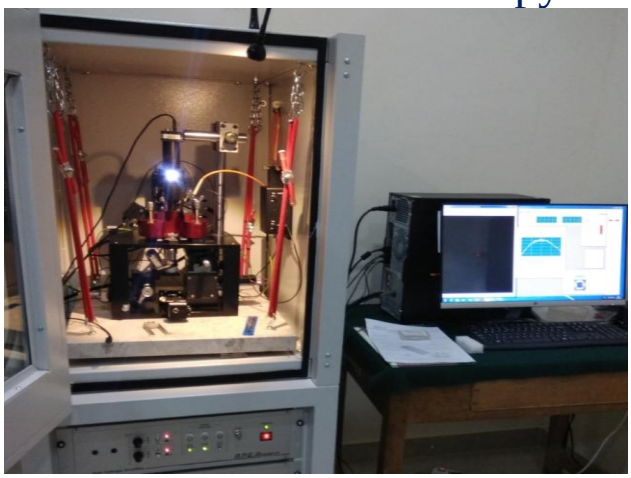
Zeta Sizer

Scanning Electron Microscopy

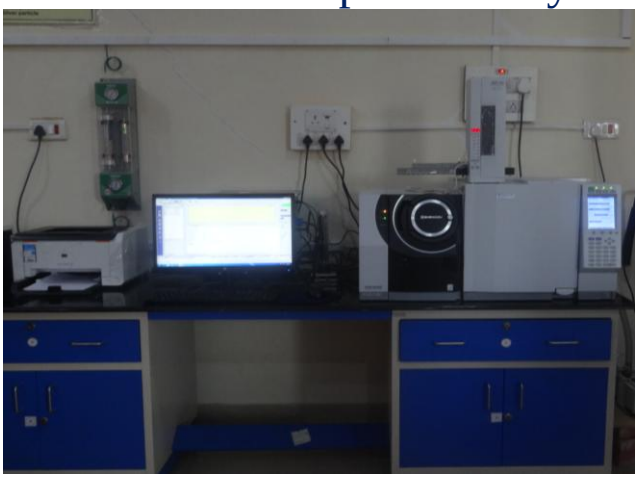


X-Ray Diffractometer

Atomic Force Microscopy

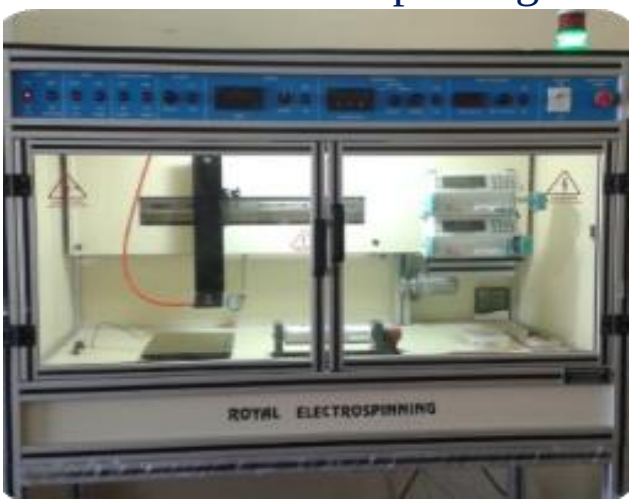


GC - Mass Spectrometry

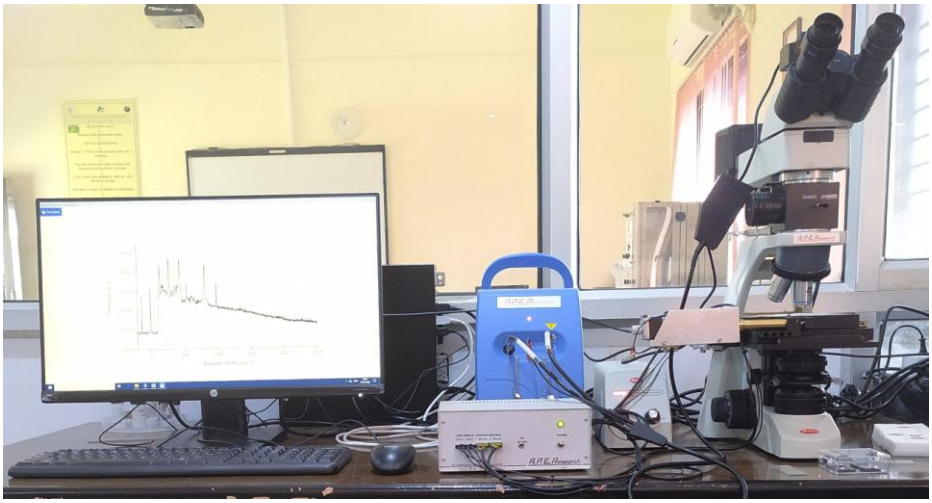


Fourier Transform Infrared Spectroscopy

Electrostatic Spinning

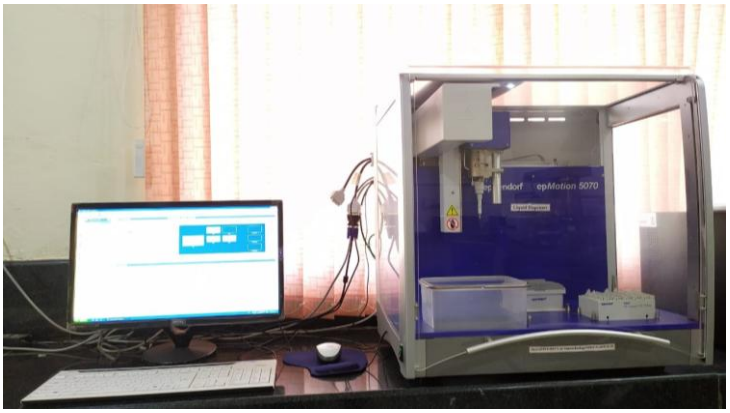


Raman Spectroscopy



High Pressure Homogenizer

Liquid Dispenser



Ultra Sonic Spray Dryer

Spectro Fluorescence Reader