Volume 1, Issue 2

R&D Newsletter

Indian Institute of Technology Kanpur

Special Issue on
Advanced Research Equipment procured under CARE scheme of IIT Kanpur

soft copy of the newsletter is available at

www.iitk.ac.in/dord/newsletter.htm

September 2013

Scanning Electron Microscope (SEM)

Procured in the Financial Year: 2010-2011

Brand - Carl Zeiss
Model Number – EVO18 Special Edition

Capabilities

A. Resolution of the SEM less than 5nm
B. Magnification up to ONE million times
C. Voltage 1 to 30 KV
D. Variable pressure mode
   (For non conducting / Biological samples)
E. Featured with following three detectors
   a. SE Mode
   b. VPSE Mode
   c. CZBSD Mode

Sputter Coater

Model – SC7620 Mini Sputter Coater
Quorum Technology

Capabilities –

1. Gold-Palladium target
2. 0 to 50mA adjustable discharge with safety cut out
3. Normal operation up to 8000V D.C. at 20mA

LOCATION

Central Facility, Second Floor, Dept. of Biological Sciences and Bioengineering (BSBE)

CONTACT

Prof. S.Ganesh (HOD, BSBE)
sganesh@iitk.ac.in

Prof. Dhirendra S. Katti (Convener)
dsk@iitk.ac.in

Ms. Shraddha Singh (Operating staff)
ssinghs@iitk.ac.in

USER CHARGES
per slot (90 minutes)

Department users - Rs. 750
Institute users
(Other than BSBE) - Rs 1000
Outside-IITK users - Rs. 3500
Gold coating: Rs. 250 for all users
(service tax is applicable for outside-IITK users)

Scanning Electron Microscope

Sputter Coater

LII (Laser Induced Incandescence) - Instrument for Soot Characterization

Procured in the Financial Year: 2010-2011

Laser-induced incandescence is an optical technique for accurate, non-intrusive, and temporally resolved measurement of soot concentration, specific surface area and primary particle diameter.

Specification

All measurements
Sampling Frequency: 20Hz

Concentration:

Low end	<1 part per trillion <2 micrograms/cubic meter
High End	10 parts per million 20 grams/cubic meter
Range	>1,000,000:1
Precision	+/ - 2%

Primary Particle Size:

Range	10 - 100 nm
Precision	+/- 2% of max

Specific Surface Area:
50 - 200 m^2/g

LOCATION

Flame Dynamics Lab
FDL-T101,
Dept. of Aerospace Engg.

Note: The machine requires its own proper supply and signal conditioning unit, compressed air and computer. Therefore, it cannot be moved out of the lab for use.

CONTACT

Dr. Abhijit Kushari
akushari@iitk.ac.in

USER CHARGES

Free

ZSX Primus II Wave length Dispersive X-Ray Fluorescence Spectrometer

Procured in the Financial Year: 2010-2011

This WD-XRF system (X-ray generator 4kW , 60kV-150mA) can detect elements from Na to U in a variety of materials in solid, powder, filtered form. The concentration range goes from ppm levels to 100 wt%. Generally speaking, elements with high atomic numbers have better detection limits than lighter elements. Quantitative analysis is done using calibration based on about thirty international rock and soil standards. All analyses are done on pressed pellets (30 mm diameter) made from fine powder (particle size ~50 micron, required quantity of about 5 grams). Recently the facility has acquired a Claisse M4 Fluxer machine for sample preparation by fusion and preparing glass disks, which eliminate particle size and mineralogical and matrix effects, resulting in high analytical accuracy.

LOCATION

X-Ray Fluorescence Laboratory,
Room No. 101, ACMS Building

CONTACT

Dr. Debajyoti Paul
dpaul@iitk.ac.in

USER CHARGES
per sample

(10 major element oxides &
20 selected trace elements)

IIT Kanpur users - Rs. 1000
Non- IIT Kanpur users - Rs. 1200+ST
Industry & Consultancy - Rs. 2000+ST
(service tax is applicable for outside-IITK users)

Optical Distributed Sensor Interrogator

Procured in the Financial Year: 2011-2012

Model A50 from Luna Technologies

The Luna ODiSI enables high resolution distributed temperature and strain measurements using simple, un-altered, telecom-grade optical fiber as the sensor. With 50 meters maximum sensing length and subcentimeter spatial resolution, the ODiSI is the paramount tool for

(I) Load, fatigue, structural or mechanical testing,

(ii) Model and simulation validation,

(iii) Structural health monitoring,

(iv) Stress profile in foundation

(v) Stress and temperature profile in pavement and foundations,

(vi) composite testing.

LOCATION

Structural Engineering Laboratory, Advance Monitoring and Sensing Room, S-LAB-STL1, Dept. of Civil Engg.

CONTACT

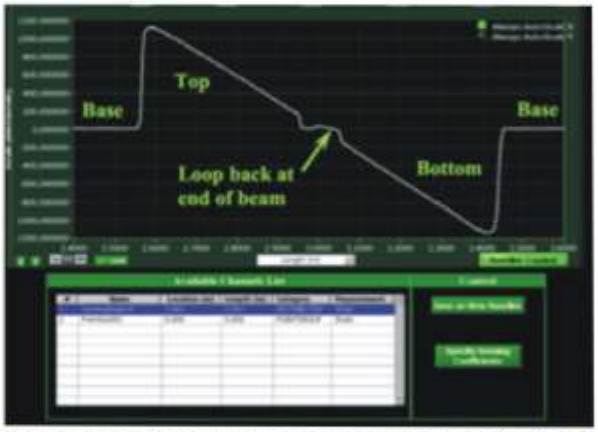
Dr. Samit Ray Chaudhuri,
samitrc@iitk.ac.in

Mr. Kunwar K. Bajpai
kunwar@iitk.ac.in

USER CHARGES

Cost of the fibre will be charged

Optical Distributed Sensor Interrogator



ODiSI distributed strain measurement along the top & bottom surfaces of a cantilever beam, 5mm spatial resolution

Key Features

- +/- 15,000 microstrain, up to 300° C
- +/- 1 microstrain, +/- 0.1°C
- Sub-cm spatial resolution
- Sampling rate 1 Hz for 50m interrogator and 3 Hz for 10m interrogator
- Easily deployable, inexpensive sensors
- 1000s of sensing points in a single fiber
- Disposable/easily replaceable
- Reduced installation time and cost
- User configurable gauge length and sensing locations
- Point and/or distributed sensing anywhere in the device or structure under test
- Temperature and/or strain in the same sensing fiber
- Intuitive touch to define sensing points and regions
- Standard GUI and user customizable software development kit
- Simple monitoring and data logging

FTIR based Emission Measurement System for Air Pollutant Measurement

Procured in the Financial Year: 2011-2012

FTIR Motor Exhaust Gas Analyzer MEXA-6000FT, an engine exhaust analyzer machine is capable of measuring 36 different regulated and unregulated engine emissions. Horiba MEXA-6000FT-E is an instrument for continuously measuring the concentration of the components included in engine emissions. A combination of the Fourier Transform Infra-Red spectroscopy (FTIR) and multivariate analysis enables the simultaneous concentration analysis of multiple components. This system can be used for different fuels as diesel, gasoline, Biodiesel, CNG, LPG and other alternative fuels.

LOCATION

Engine Research Lab
Central Workshop Complex, IITK

CONTACT

Prof. AK Agarwal
akag@iitk.ac.in

USER CHARGES

Rs 2000 per sample
(service tax is applicable for outside-IITK users)

Dynamic High-Resolution Polarized Inverted Laser Confocal Fluorescence Microscopy

Procured in the Financial Year: 2010-2011

- Inverted Microscope
- Confocal and reflected mode operation
- Individually controllable continuous wave lasers
- Ar, 65mW: 458, 476, 488, 514 nm;
- - HeNe, 20 mW: 543: Green
- - HeNe, 2 mW: 633: Red
- Multi-dimensional image capture in Space (X,Y,Z) and time (t)
- Conventional scanning at 5 FPS at 512 X 512 pixels to 54 fps at 512 x 16 pixels
- Typical resolution in X, Y : 200 nanometers
- Maximum depth of view Z (depends on the objective): about 1000 microns
- Three channel Spectrometer detector for high quality spectral image series
- Polarizer-Analyzer Attachment

LOCATION

Micro-fabrication Laboratory, NL-1, Department of Mechanical Engineering, IITK

CONTACT

Prof. P. K. Panigrahi
panig@iitk.ac.in

USER CHARGES

Free

Note : A slot has to be booked for using the machine

400 MHz NMR Machine with Upgraded Console

Procured in the Financial Year: 2011 - 2012

The support from CARE was used to upgrade the CONSOLE of the 400 MHZ NMR machine. The instrument is fully functional and is one of the most essential tools for structural characterization. It is widely used by researchers from the Chemistry Department and it also receives samples from other departments like Chemical Engineering and BSBE for analysis.

LOCATION

Core Lab 106b

CONTACT

Dr. Ramesh Ramapanicker,
ramesh@iitk.ac.in

Dr. Anand Singh
anands@iitk.ac.in

USER CHARGES

Rs. 10.00 per sample for ^{1}H NMR
Rs. 25.00 per sample for ^{13}C NMR
(service tax is applicable for outside-IITK users)

A Probe Station for Temperature and Magnetic Field Dependent Electrical Measurements on Thin Films, Devices and Materials

Procured in the Financial Year: 2010-2011

Capabilities

Temperature dependent probe station with capabilities to make electrical measurements from 20 K to 600 K.

LOCATION

Western Lab - 105

CONTACT

Dr. Ashish Garg,
ashishg@iitk.ac.in

Mr. Rajesh Katoch
rajeshhk@iitk.ac.in

USER CHARGES

Rs. 1000/- per 3 hrs slot
(service tax is applicable for outside-IITK users)

Plasma Cleaning System: A TEM sample preparation accessory

Procured in the Financial Year: 2011-2012

Model: Solarus, GatanInc, USA

Entire range of material, metals alloys, ceramics, polymers, composites, electronic as well as biological samples can be studied under various modes of operation of the microscope. But, sample preparation requirement for successful observations is rather stringent and varied depending on the material. The final cleaning of the sample involved organic solvents in many cases. This leaves a contaminant layer of about 5nm on top of the surface of the sample. This layer brings down the quality of images. The plasma cleaning removes the contamination layer without any damage to the sample surface. This opens up additional scope of investigations and also enable the users to take the full advantage of the high resolution capability of the machine.

Another utility of the system is in cleaning up the sample after studying the sample for a specific duration. An intermittent cleaning with plasma removes all contamination and the sample becomes fit again to carry out the studies to its completion.

Elemental analysis with the EDAX system is another situation wherein the plasma cleaning is of great importance. In carrying out the EDS analysis a focused probe of electrons irradiate a sample region of 10-20nm and analyses the X-ray signal generated. During this period of about 50-100 seconds of irradiation, the specific region gets a carbon contamination built up and imaging this area is not possible after EDS analysis. In this sort of situations the plasma cleaning of the sample completely removes the contamination only in about 10-15 minutes.

LOCATION

Western Lab, EM Facility,
Room No. 107, IITK

CONTACT

Dr. Gouthama
gouthama@iitk.ac.in

G P Bajpai
gpbajpai@iitk.ac.in

USER CHARGES

No Separate charges. TEM users who use the facility pay a nominal charge for TEM usage.

The Solarus plasma cleaning system that is available at EM facility, MSE has the provision for using it with a range of TEM models as well as for SEM stages. Plasma cleaning system will not only enhance the quality of work but also open up for the complete utilization the TEM capability.

Significance and advantages:

- Enhanced Imaging capability
- Improved accuracy when preforming composition microanalysis
- Longer viewing & acquisition times for EDX and EBSD in a SEM
- Use of smaller probe size; a “must” for STEM and EELS analysis in a TEM/STEM

Contact Angle Goniometer

Procured in the Financial Year: 2011-2012

The machine "Contact Angle Goniometer" is designed to investigate interfacial properties (surface free energy, wettability, surface/interfacial tension) of solid-solid, solid-liquid and liquid-liquid interface. The machine is designed with four software controlled dosing unit (electronic syringes) to eject controlled amount of various liquids on a solid surface. The machine has normal as well as high speed imaging capability to explore static and dynamics of interfacial properties. It also has an environmental chamber to manipulate environmental conditions e.g. temperature, humidity, gas and study its effect on interfacial properties.

LOCATION

Southern Lab - 20

CONTACT

Dr. Krishnacharya,
kcharya@iitk.ac.in

Ms. Reeta Pant
reeta@iitk.ac.in

USER CHARGES

Contact angle/surface tension measurement (ambient condition)- Rs. 200

Interfacial tension (between two fluids) measurement (ambient condition)- Rs. 500

Surface free energy of solid measurement (ambient condition)- Rs. 1000

Measurement involving environmental chamber (variable temp, humidity)- Rs. 2000

Measurement involving high speed camera (upto 1000 fps)- Rs. 2000

(service tax is applicable for outside-IITK users)

Recent Announcements from DORD

Call for India-Singapore Joint project proposals in the area of Advanced Materials & Energy (last date for submission November 15, 2013)
http://web.iitk.ac.in/dord/file/COP_DST-ASTAR/India_Singapore_Joint_CFP.html (intranet only)

Rajiv Gandhi HUDCO Fellowship Programme in the Habitat Sector
http://web.iitk.ac.in/dord/file/Rajiv_Gandhi_HUDCO_Fellowship_Programme.pdf (intranet only)

Feedback/Suggestions

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