

**CENTER FOR SURFACE SCIENCE AND NANOTECHNOLOGY**  
**POLITEHNICA University of Bucharest (CSSNT-UPB)**  
**([www.cssnt-upb.ro](http://www.cssnt-upb.ro))**

CSSNT-UPB represents a scientific research facility founded in 2011, with a valuable expertise in the field of synthesis and advanced characterization of a large range of micro- or nanomaterials and structures for applications in biosensors, solar cells, MEMS, micro- and nanoelectronics, nanooptics and smart clothing.

CSSNT-UPB was and is involved in several national and European projects, including EuroNanoMed (NANODIATER), M-ERA NET (NANOCOATIL, NANOFOAM, NOVINALBEST), ENIAC (Lab4MEMS) etc.

Recently, CSSNT-UPB finalized a large project, NANODIS, co-financed by European Structural Funds, focused on developing its research infrastructure. Therefore several laboratories are fully operational and able to provide high quality services and top performance results in the field of nanomaterials and nanostructures synthesis and characterization as well as mechanic and electronic device characterization.

## Laboratories at CSSNT-UPB

- ❑ Laboratory of advanced electronic microscopy, e.g., SEM, SEM-STEM, SEM-EBL;
- ❑ Laboratory of advanced Atomic Force Microscopy, e.g., atomic resolution in air;
- ❑ Laboratory of micro-Raman and nanooptics and nanospectroscopy;
- ❑ Laboratory of structural and chemical characterization, e.g., XRD, XRF
- ❑ Laboratory of mass spectrometry, e.g., gases, liquids, solids;
- ❑ Laboratory of spectroscopy, e.g., UV-Vis, NIR, FT-IR;
- ❑ Laboratory of electrochemical micro- and nanostructured coatings;
- ❑ Laboratory of thin films deposition, e.g., “MBE”-PLD, RF&DC sputtering;
- ❑ Laboratory of micro- and nanolithography (cleanroom facility, class 100);
- ❑ Laboratory of electrical, optical and magnetic measurements at low temperature;
- ❑ Laboratory of solar cells, MEMS and chip evaluation and testing;
- ❑ Laboratory of specimens preparation;

# SCIENTIFIC AND TECHNICAL TEAM

## **COORDINATOR:**

Professor Dr.rer.nat. **Marius Enachescu**

e-mail: [marius.enachescu@upb.ro](mailto:marius.enachescu@upb.ro)

## **Team specialists:**

- Prof. Dionezie Bojin
- Prof. Teodor Visan
- Prof. Adrian Volceanov
- Dr. Liana Anicai, Senior Scientist
- Dr. Florentina Golgovici, Assoc. Prof.
- Dr. Anca Cojocar, Assoc. Prof.
- Dr. Mariana Prodana, Lecturer
- Dr. Alina Pruna
- Dr. Adrian Katona

## SERVICES

- **Atomic and nanometer scale morphological and structural characterization of micro-/nanomaterials and structures;**
- **Evaluation of electrical, thermal, optical and magnetic properties of thin films, oxide powders, ferroelectric and magnetic materials at low temperatures;**
- **Design and synthesis of carbon nanotubes, carbon nanofibers and graphene based nanostructures with applications in solar cells, biosensors, micro- and nano-electromechanical devices;**
- **Synthesis and manufacturing of novel nanostructured metallic and oxide materials, including nanoparticles, nanowires, thin films with applications in solar cells, batteries, hydrogen production through water electrolysis, micro- and nano-electronics;**
- **Evaluation of corrosion performance of various metallic materials and coatings involving accelerated laboratory tests;**
- **Complex physical-chemical characterization and testing of materials and devices**
- **Advanced optical and fluorescent characterization of soft, liquid or solid specimens;**
- **Qualitative and quantitative determination of organic and inorganic polluting compounds from soil, liquid and air samples**
- **Evaluation of defects and contaminants in various metallic and non-metallic materials**

# EQUIPMENT

## EQUIPMENT NAME:

**Scanning Electron Microscope (SEM)-Scanning Transmission Electron Microscope (STEM) equipped with real time EDX (Energy Dispersive X ray) and electron diffraction analytical techniques**

## PART OF:

CSSNT-UPB, Laboratory of electronic micro-spectroscopy

**CATALOG NAME: *HITACHI HD-2700***

**YEAR: 2015**

**PRODUCER: *HITACHI High-Technologies Corporation, Japan***

## DATA SHEET:

## DESCRIPTION:

The equipment allows the morphological characterization at micro- and nanometric level of a large range of nanomaterials and of the micro- and nanocomponents of various devices, combining electronic scanning imaging – SEM/STEM. The system facilitates a high level resolution, e.g., 0.5 nm (SEM mode) and 0.14 nm (STEM mode) *at the same location* of the specimen.



# EQUIPMENT

## EQUIPMENT NAME:

**Atomic Force Microscope (AFM) – RAMAN dual system**

## PART OF:

CSSNT-UPB, Laboratory of Raman nano-spectroscopy

**CATALOG NAME: NTEGRA SPECTRA**

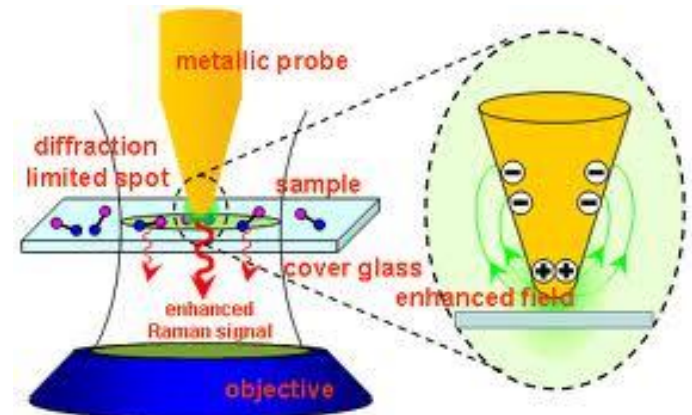
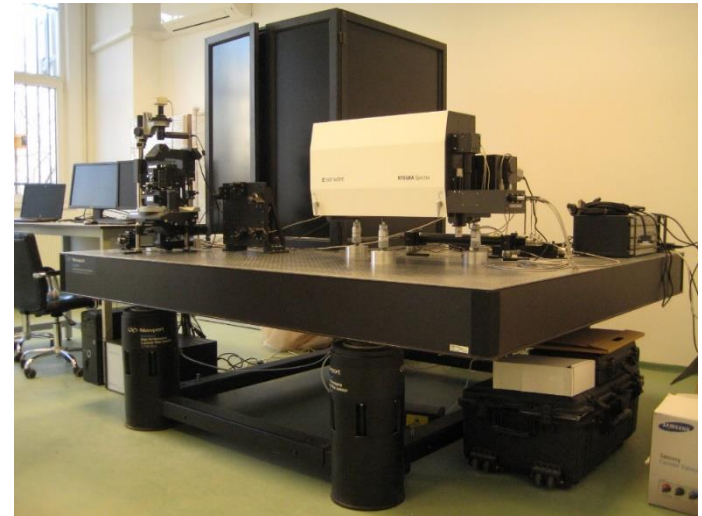
**YEAR: 2015**

**PRODUCER: NT-MDT**

## DATA SHEET:

## DESCRIPTION:

This integrated system, unique in Europe and the second in the world (the first being installed at „Lawrence Berkeley National Laboratory”, California-USA) has been equipped with a complex Raman nano-spectroscopy system. The equipment possesses several independent systems for multi axial positioning able to provide nanometer resolution and to bring at the same position a nanometer AFM tip, a laser fascicle at the diffraction limit and the investigated structures. Thanks to the specially prepared AFM probe, the equipment is also able to perform advanced investigations through TERS (Tip Enhanced Raman Spectroscopy), providing a spatial resolution down to 10 nm.



# EQUIPMENT

## EQUIPMENT NAME:

**Axio Observer Z1 - Inverted Fluorescence Microscope**

## PART OF:

CSSNT-UPB, Laboratory of micro-Raman and nanooptics and nanospectroscopy

**CATALOG NAME: *Axio Observer Research***

***Microscope***

**YEAR: 2015**

**PRODUCER: *Zeiss, Germany***



## DESCRIPTION:

Axio Observer Z1 - Inverted Fluorescence Microscope is a state of art equipment, suitable for examinations in transmitted, incident and fluorescent light, using halogen and fluorescent sources. Fluorescence can be used as a tag or a label when preparing specific biological samples. The microscope is used in various fields of scientific research, especially in biological and medical research, in sub-fields as cell mechanics, cancer cells, drug delivery or nanoparticle tracking in cells and tissues.

The key feature of this inverted microscope is that it has the most efficient, flexible and gentlest fluorescence, protecting the cells and leading to excellent results. From center to edge, in multichannel fluorescence all wavelengths are equally balanced in intensity. Also, it combines transmitted light microscopy techniques such as phase contrast and differential interference contrast with fluorescence microscopy.

Besides biological samples, incident light is used for opaque/metallographic samples analysis. The system allows automatic sample scanning using a high stability motorized stand with x, y movement and a dedicated software with advanced analytics which enables the overlapping of images acquired in various fields.

# EQUIPMENT

## EQUIPMENT NAME:

**Home-Built Atomic Force Microscope**

## PART OF:

CSSNT-UPB, Laboratory of advanced Atomic Force Microscopy

**CATALOG NAME: Atomic Force Microscope**

**YEAR: 2014**

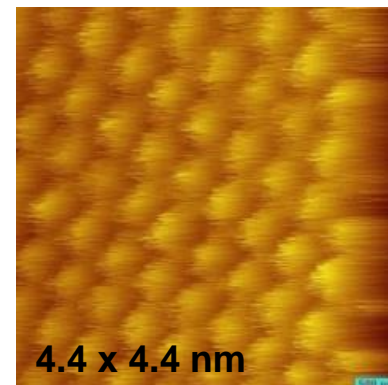
**PRODUCER: *Homebuilt***

**DATA SHEET:**

## DESCRIPTION:

Coupled with the **R9 – RHK Controller** which has various auxiliary I/O signal ports for customized experiments (including ultra low noise inputs), 2 integrated lock-in amplifiers and one PLL, our **Home-Built AFM Head** is suitable for various AFM techniques such as Contact, Non-Contact, Intermittent Contact, Atomic Resolution, AFM Spectroscopy (F-z Curves), I-AFM (current mapping, I-V spectroscopy), SPFM (AC and DC) and SKPFM.

The AFM system is equipped with an enclosure for acoustic/electrostatic insulation and for controlled atmosphere (humidity, gas, etc.)



**Atmospheric pressure**

**Room temperature**

**Image made by viewing  
friction mode**

**Stick-slip motion of the tip  
over the atomic lattice**



# EQUIPMENT

## EQUIPMENT NAME:

Micro-Raman confocal Spectroscopy

## PART OF:

CSSNT-UPB, Laboratory of micro-Raman and nanooptics and nanospectroscopy;

**CATALOG NAME: LabRAM HR800**

**YEAR: 2011**

**PRODUCER: HORIBA Scientific, U.S.**

## DATA SHEET:

## DESCRIPTION:

The LabRAM HR is a powerful analytical system with exceptional spectral performance. The system features high spectral resolution (UV –  $1.5 \text{ cm}^{-1}$ ; VIS –  $0.6 \text{ cm}^{-1}$ ; NIR -  $0.3 \text{ cm}^{-1}$ ), multiple laser and detector options. Even in the UV, its 800 mm focal length spectrograph provides spectral resolution and efficiency.

The system has 6-position ND module, a high stability optical design and is equipped with an internal red laser (633 nm) with the power of 17 mW and an external green laser (533 nm) with the power of 50 mW. The equipment operates on 200 – 1600 nm spectral range and it is equipped with two switchable gratings (600 lines/mm and 1800 lines/mm).

A range of specialized stages can be attached to the instrument for in-situ analysis in various conditions: heating/cooling stages up to  $1500^{\circ}\text{C}$  or down to  $-196^{\circ}\text{C}$ , controlled humidity (vapor pressure) stages.



# EQUIPMENT

## EQUIPMENT NAME:

**Scanning Electron Microscope (SEM)-E-Beam  
Lithography System (EBL) equipped with EDX (Energy  
Dispersive X ray)**

## PART OF:

CSSNT-UPB, Laboratory of micro- and nano-lithography

**CATALOG NAME: SU8230**

**YEAR: 2015**

**PRODUCER: *HITACHI High-Technologies  
Corporation, Japan***

## DATA SHEET:

### DESCRIPTION:

The SEM-EBL system facilitates the fabrication of submicron devices or of the nanometer sized components due to the use of the very narrow electrons fascicle (nanometer size) and of the selected design involving the equipment software. The desired geometrical configuration is thus created on the resist layer deposited onto the material. The technical limit of light diffraction (specific to photolithography) is exceeded involving the current SEM-EBL nanolithography installation and the fabrication of submicron devices or of the nanometer sized components is possible. The simultaneous morphological and topological analysis of the built geometrical nanostructures is also possible due to the SEM microscope present in the system. SEM resolution is below 0.7nm.



# EQUIPMENT

## EQUIPMENT NAME:

**High Resolution SmartLab X-ray diffractometer, 9kW with rotating anode**

## PART OF:

CSSNT-UPB Laboratory of structural and chemical characterization

**CATALOG NAME: SmartLab X-ray diffractometer**

**YEAR: 2015**

**PRODUCER: *Rigaku Corporation Tokyo Branch, Japan***



## DATA SHEET:

### DESCRIPTION:

Smartlab represents a completely automatized, complex, high resolution, multimodal diffractometer able to facilitate the advanced structural characterization of a large range of materials, as powders or thin films, including nanomaterials, metals, advanced composites, nano-magnetic materials, polymers, electronic and optoelectronic materials, biological specimens.

SmartLab incorporates intelligent, application specific protocols in all measurement types. It includes as standard Rigaku's patented Cross Beam Optical (CBO) technology that uses simultaneously mounted, simultaneously aligned optical components for both focusing (Bragg-Brentano) and parallel beam diffractometer geometries. It can be switched between the two geometries without the need to remove, replace, or realign optical components. The addition of in-plane attachment (suitable for thin films investigations) makes possible the evaluation of structures perpendicular to the sample surface and perform depth profiling without base information. Dedicated software provides fine-grain control over the 4 - axis thin film sample stage and rotary attenuator, automatically optimizing the sample position.

The selected configuration also allows high resolution for SAXS, U-SAXS and "micro-area" measurements.

# EQUIPMENT

## EQUIPMENT NAME:

XRF for rapid coating thickness measurement and materials analysis

## PART OF:

CSSNT-UPB, Laboratory of structural and chemical characterization

**CATALOG NAME: MAXXI 6**

**YEAR: 2015**

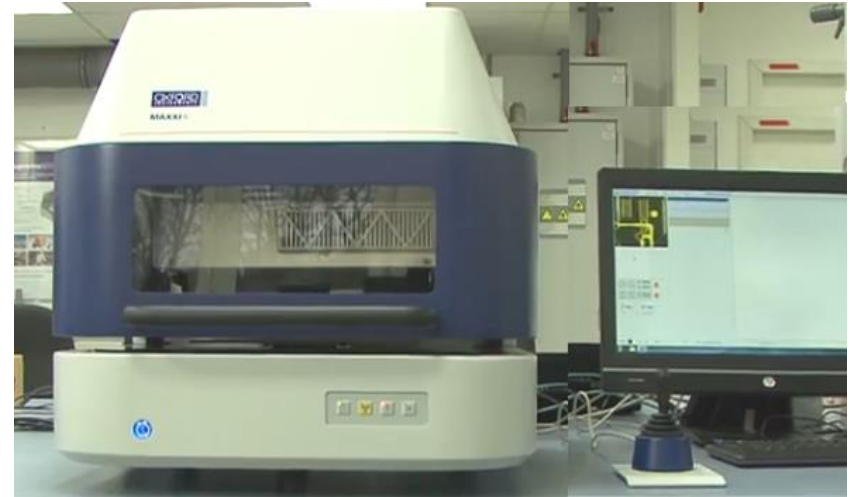
**PRODUCER: *Oxford Instruments plc, UK***

## DATA SHEET:

## DESCRIPTION:

The equipment allows coating thickness measurement based on X-ray fluorescence (XRF), providing easy to use, fast and non-destructive analysis. It is capable of analyzing coating thickness (single / multi-layer) and elemental composition, in the elemental range from 13Al to 92U. Superior resolution and high efficiency SDD (Silicon Drift Detector) detector offers optimal efficiency at all energy levels with improved limits of detection (LOD), thus being possible to measure the thinnest coatings and element composition at trace level. Micro-focus Be window X-ray tube combines high precision analysis, shorter measurement times with field proven high reliability and outstanding lifetime.

Multi collimator assembly optimizes flux generation, enhancing measurement throughput. Giant slotted chamber design with Motorized Z Travel and Programmable XY Stage, with generous interior volume facilitates the analysis of standard and oversized samples.



# EQUIPMENT

## EQUIPMENT NAME:

**UV/VIS/NIR Spectrophotometer equipped with integrated sphere**

## PART OF:

CSSNT-UPB, Laboratory of spectrometry

**CATALOG NAME: LAMBDA 950 UV/VIS/NIR Spectrophotometer**

**YEAR: 2015**

**PRODUCER: *Perkin Elmer, USA***

## DATA SHEET:

### DESCRIPTION:

LAMBDA 950 spectrophotometer uses a gridless PMT with Peltier-controlled PbS detector to achieve high-performance testing across the spectral range up to 3300 nm. The UV/Vis resolution reaches 0.05 nm, while the NIR resolution reaches up to 0.20 nm.

It also features additional components and accessories for sample control and flexibility, including: (●) large, dual sample compartments; (●) universal reflectance accessory; (●) snap-in integrating sphere of 150 mm to capture diffuse and specular reflectance.

The equipment configuration and capabilities facilitates the optical characterization of a large range of liquid and solid specimens, as well as in the development of solar cells.



# EQUIPMENT

## EQUIPMENT NAME:

FT-IR Spectrometer

## PART OF:

CSSNT-UPB, Laboratory of spectrometry

**CATALOG NAME: Spectrum Two FT-IR Spectrometer**

**YEAR: 2015**

**PRODUCER: *Perkin Elmer, USA***

## DATA SHEET:

### DESCRIPTION:

The equipment operates on  $8300 - 350 \text{ cm}^{-1}$  spectral range with an optimum resolution of  $0.4 \text{ cm}^{-1}$  for  $3028 \text{ cm}^{-1}$ . It is equipped with AVC (Atmospheric Vapor Compensation) features designed to compensate for  $\text{CO}_2$  and  $\text{H}_2\text{O}$  absorptions in real time and APV (Automatic Precision Validator) to validate the instrument precision and reproducibility. In addition the equipment includes Universal Diamond/KRS-5 ATR component to facilitate the analysis of a large range of specimens including solids, liquids, paste, gels, etc.

A complete and complex *Spectrum software* package supports the operation, including COMPARE, Beer's Law QUANT, Soft Spectrum Search Plus, Soft IR Expert, AVI (Absolute Virtual Instrument).



# EQUIPMENT

## EQUIPMENT NAME:

**Cryogen-Free Measurement System (mCFMS)**

## PART OF:

CSSNT-UPB, Laboratory of electrical and magnetic measurements at low temperature

**CATALOG NAME: Mini CFMS**

**YEAR: 2015**

**PRODUCER: *Cryogenic Ltd., London, UK***



## DATA SHEET:

### DESCRIPTION:

The system includes a cryocooler, cryostat with 9T superconducting magnet, variable temperature sample space, a selection of special probes for measurements of different physical properties, as well as electronics, computer and measurement software. It is a completely dry system that operate superconducting magnet and control sample temperature without the need for liquid nitrogen or liquid helium. The temperature range of the system is 1.6K – 700K.

mCFMS incorporates: (●) the Electrical Transport module (DC & AC) providing a capability to perform resistance measurements, Hall voltage measurements, I-V curves, real and imaginary parts of impedance  $Z$  - Varying temperature:  $Z(T)$ / Varying magnetic field:  $Z(H)$ / Varying source current:  $Z(I)$ , Hall voltage (4-terminal configuration); (●) the Thermal properties module able to perform heat capacity measurements and thermal transport measurements (thermal conductivity, thermal EMF - Seebeck effect and resistivity); (●) the magnetic measurements module.

# EQUIPMENT

## EQUIPMENT NAME:

Excimer Laser

## PART OF:

CSSNT-UPB, Laboratory of thin films deposition

**CATALOG NAME:** Compex Pro 205 F

**YEAR:** 2010

**PRODUCER:** *Coherent Germany*

## DATA SHEET:

## DESCRIPTION:

The ***most powerful excimer laser***.

For this laser there are 2 possible working gas mixtures in UV range : ArF 193 nm and KrF 248 nm

Pulse repetition rate from 1 to 50 Hz

Maximum energy/pulse 700mJ and pulse duration is 20 ns.

Max power/pulse = 35 MWatt

The equipment is used for ***laser ablation in UHV ( $10^{-10}$  Torr)*** as well as for carbon based nano-materials synthesis such as: ***Single Wall Carbon Nanotubes, Nano-onions, Graphene*** in a home made reactor.





# EQUIPMENT

## EQUIPMENT NAME:

“MBE” – Pulsed Laser Deposition System

## PART OF:

CSSNT-UPB, Laboratory of thin films deposition

## CATALOG NAME:

MBE Model SMART Laser PLD

YEAR: 2011

PRODUCER: *SVT Associates Inc., USA*

## DATA SHEET:

## DESCRIPTION:

Pulsed Laser Deposition System is a unique versatile research tool. The system offers a broad range of materials and applications. The ability to extend the vacuum capabilities to **Ultra High Vacuum** base pressures allows the control of unwanted film impurities. Up to now, our best vacuum level is  $1.5 \cdot 10^{-10}$  Torr.

The laser target manipulator accommodates up to six 1" diameter targets (or four 2") in vacuum which are selectable through the controlling computer. Each of the individual targets can be rotated about its axis, which together with the laser scanning provides a uniform ablation of the target. Using this flexibility, a multitude of thin film structures deposition are possible.

In-situ monitoring tools such as **RHEED** provide the process feedback in Laser “**MBE**”, i.e., makes possible controlled layer-by-layer deposition.



# EQUIPMENT

## EQUIPMENT NAME:

**Mantis Thin Films Deposition System**

## PART OF:

CSSNT-UPB, Laboratory of thin films deposition

**CATALOG NAME: Mantis Cube**

**YEAR: 2015**

**PRODUCER: Mantis U.K.**

**DATA SHEET:**

## DESCRIPTION:

The equipment allows deposition of thin films. The thickness of layers can be monitored in-situ by quartz crystal microbalance. The cube is pumped out by powerfully turbo pump. Evaporation sources:

- Dual thermal boat source for CUBE system (length 300mm) with one power supply (600W and W-boats (10 off).
- 1000mm<sup>3</sup> single pocket e-beam evaporator with 250W digital power supply, and one Mo crucible for CUBE System.
- 2" sputter magnetron source for CUBE deposition system. Includes 720W DC power supply and cables for CUBE System.
- 300W RF power supply and automatic matching network for CUSP source.

The equipment covers a wide range of coating materials (metals, semiconductors, oxides, etc.)



# EQUIPMENT

## EQUIPMENT NAME:

**Carbon nanomaterials synthesis chamber  
(carbon nanotubes, carbon nano-onions,  
graphene)**

## PART OF:

CSSNT-UPB, Laboratory of specimens  
preparation

**CATALOG NAME: Multipurpose chamber**

**YEAR: 2011**

**MANUFACTURER : *Homemade, patent  
pending***

**DATA SHEET:**

## DESCRIPTION:

The ablation chamber for nanomaterials synthesis is a powerful equipment for the production of high quality and purity nanomaterials such as ***Single Wall Carbon Nanotubes, Nano-onions, Graphene***, etc. due to an improved “homemade design”. The chamber allows to control with high accuracy a wide range of reaction parameters: temperature (up to 1300°C), pressure and gas flow rate, facilitating to synthesize a large variety of nanomaterials with important applications: solar cells, biosensors, hydrogen storage, nanoelectronics.



# EQUIPMENT

## EQUIPMENT NAME:

**Spectroscopic Ellipsometer**

## PART OF:

CSSNT-UPB, Laboratory of nano-structured coatings

**CATALOG NAME: M-2000® Spectroscopic Ellipsometer**

**YEAR: 2015**

**PRODUCER: J.A. Woollam Co., Inc., USA**

## DATA SHEET:

## DESCRIPTION:

The equipment allows measurements covering the entire spectral range from UV to NIR that are accomplished in seconds, thus being suitable for a large range of applications, including dielectric, organic thin layers and amorphous semiconductors characterization. The M-2000 Ellipsometer uses a CCD detector for simultaneous measurement of hundreds of wavelengths. The equipment incorporates the rotating compensator technology (RCE), thus facilitating: a high accuracy on any sample; measurement of full range of Psi (0 to 90°) and Delta (0° to 360°); determination of depolarization and measurement of more elements of the Mueller-matrix. The available software packages allow fast and reliable data acquisition, data analysis, optical simulations and routine calibrations.

Thin layer thickness and optical constants are mainly determined involving ellipsometry.



# EQUIPMENT

**EQUIPMENT NAME:**  
**MEMS and Chip Manual Probe System**

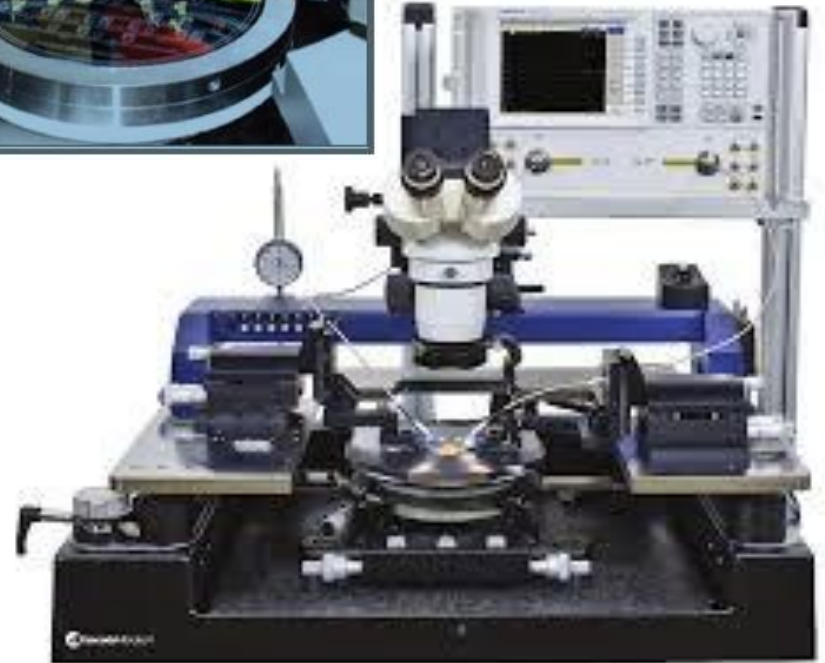
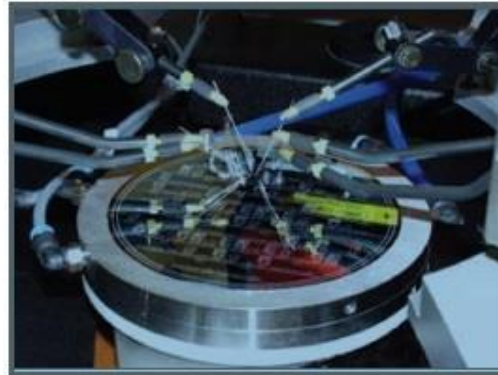
**PART OF:**

CSSNT-UPB, Laboratory of MEMS and chip evaluation and testing

**CATALOG NAME: PM8 Probe System**

**YEAR: 2015**

**PRODUCER: Cascade Microtech, Inc., USA**



**DATA SHEET:**

**DESCRIPTION:**

The equipment is designed to provide a highly stable, ergonomic and flexible probing platform for precise analytical probing applications **up to 200 mm**, such as **device and wafer characterizations, failure analysis (FA), RF/mmW and sub-THz probing, opto-engineering and MEMS**.

The system has a fine-glide chuck stage on highly-stable granite base which is ideal for sub-micron probing, active platen cooling for thermal stability, solid structure, superior vibration attenuation, independent X-Y chuck stage movement, simple and easy to use microscope

# EQUIPMENT

## EQUIPMENT NAME:

**Solar Simulator**

## PART OF:

CSSNT-UPB, Laboratory of solar cells, MEMS and chip evaluation and testing

## CATALOG NAME:

**Solar Simulator Sun 2000**

**YEAR: 2011**

**MANUFACTURER : *ABET TECHNOLOGIES, Inc.***

## DATA SHEET:

### DESCRIPTION:

The solar simulator is a device that provides illumination approximating natural sunlight. The purpose of the solar simulator is to provide a controllable indoor test facility under laboratory conditions, used for the testing of solar cells and other materials and devices. Abet Technologies systems are constructed to allow standards ASTM, IEC, JIS used for photovoltaic testing. The Abet Gen II optical design, patent pending, dramatically increases the percentage of photons reaching the work plane. The compact design of the systems, combined with the long working distance optics, leaves the space below these instruments wide open for any sample positioning or testing equipment.



# EQUIPMENT

## EQUIPMENT NAME:

Potentiostat/Galvanostat/EIS/QCM

## PART OF:

CSSNT-UPB, Laboratory of electrochemical micro- and nanostructured coatings

CATALOG NAME: PARSTAT 4000 + PAR QCM 922A

YEAR: 2015

PRODUCER: *Princeton Applied Research*

DATA SHEET:

## DESCRIPTION:

The equipment is the only electrochemical workstation available with the ability to provide scientists with a 4 A maximum current range, 80 fA minimum current range (2.5 nA resolution), 10 V polarization voltage and 48 V of compliance voltage. Electrochemical Impedance Spectroscopy (EIS) capability is built-in and it has a frequency range of 10  $\mu$ Hz to 10 MHz. The increased bandwidth, to 10 MHz, provides for the ability to measure electronic and ionic conductivity. VersaStudio software package allows fast and reliable data acquisition and data analysis. The equipment also includes a high sensitivity Quartz Crystal Microbalance setup with weight resolution of 0,1 ng/Hz developed for piezoelectric gravimetry in the ng- $\mu$ g regions for monolayer weight change analysis. The equipment is ideal for Energy Storage, Physical Electrochemistry, Nanotechnology Research and Corrosion Studies applications.



# EQUIPMENT

## EQUIPMENT NAME:

Potentiostat/Galvanostat/EIS/ECD

## PART OF:

CSSNT-UPB, Laboratory of electrochemical micro- and nanostructured coatings

**CATALOG NAME: PGSTAT302N + FRA32M + ECD + SCAN250**

**YEAR: 2015**

**PRODUCER: *Metrohm AUTOLAB***

## DATA SHEET:

## DESCRIPTION:

The equipment is a tool for investigating mechanisms in electrodeposition, electrodisolution, passivity and corrosion studies, diffusion of ions across membranes, study of semiconductor interfaces and biosensors, characterization of coatings, batteries, fuel cells and corrosion phenomena. The setup includes a FRA32M module allowing both potentiostatic and galvanostatic impedance measurements over a wide frequency range of 10  $\mu$ Hz to 32 MHz, an extreme low currents ECD module having a current resolution of 30 fA which allows electrochemical measurements on micro-electrodes and detection of heavy metals in aqueous solutions in ultra low concentrations and an analog scan generator (SCAN250) for studying fast transients processes.





# EQUIPMENT

## EQUIPMENT NAME:

**Mass Spectrometer coupled to Liquid Chromatography (LC-MS)**

## PART OF:

CSSNT-UPB, Laboratory of spectrometry, e.g., gases, liquids, solids;

**CATALOG NAMES: Accu TOF 4G LC Plus**

**Shimadzu Nexera-I LC 2040C**

**YEAR: 2015**

**PRODUCERS : JEOL & SHIMADZU JAPAN**



## DESCRIPTION:

This is a modern system for mass determination of different compounds contained in solid, liquid and gas phase samples. It covers a wide range up to 10000 AMU with a resolution of  $10^{-5}$  AMU. The detection limit is of the order of ppm. The device is equipped with 3 types of ionization sources: ESI (Electro Spray Ionization), APCI (Atmospheric Pressure Chemical Ionization) and DART (Direct Analysis in Real Time). Also to the mass spectrometer is coupled a Liquid Chromatograph with UV-VIS detector allowing the separation of the compounds in the liquid sample. The LC is a versatile tool being equipped with autosampler with the control of the sample temperature which can inject down to  $0.1\mu\text{L}$  of sample, column temperature controller and quaternary pump for gradient operation mode to increase the separation performances.

# EQUIPMENT

## EQUIPMENT NAME:

Thermogravimetric analyzer (TGA)

## PART OF:

CSSNT-UPB, Laboratory of structural and chemical characterization

## CATALOG NAME:

Simultaneous Thermal Analyzer STA 8000

YEAR: 2015

MANUFACTURER : *Perkin Elmer, USA*

## DATA SHEET:

## DESCRIPTION:

The PerkinElmer range of Simultaneous Thermal Analyzers (STA) offers real-time measurement and analysis of sample weight change and heat flow up to 1600°C, suited for both research and routine applications. It is a powerful tool of characterizing the thermal stability of inorganics, organics, polymers oils, nanomaterials and biological samples too, in inert or oxidative atmosphere. STA combines Differential Thermal Analysis (DTA) with Differential Scanning Calorimetry (DSC) and with proven Thermogravimetric Analysis (TGA). The system offers reliable results and simple data interpretation.



# EQUIPMENT

## EQUIPMENT NAME:

Langmuir-Blodgett films deposition, e.g.,  
**SAM**

## PART OF:

CSSNT-UPB, Laboratory of thin films deposition

**CATALOG NAME:** KSV-NIMA KN2002-  
Langmuir-Blodgett-Trough

**YEAR:** 2015

**MANUFACTURER :** BIOLIN SCIENTIFIC –  
KSV NIMA



## DATA SHEET:

### DESCRIPTION:

KSV NIMA Langmuir-Blodgett trough is a strong tool used for the fabrication and characterization of single molecule thick films, including self-assembled monolayers (**SAM**), and offers the precision control over the lateral packing density of molecules. Nanoscale films of custom thickness can be built up by repeating the deposition techniques.

The Langmuir-Blodgett trough has a sensitive force balance and moveable barriers that can maintain the surface pressure of a monolayer as the substrate is withdrawn from the trough with the monolayer at its surface. The maximum substrate size is 56 mm high, 52 mm wide, and 3 mm thick. The subphase volume in the trough is 176 mL. The force balance can sense a surface tension of up to 150 mN/m with a resolution of 4  $\mu$ N/m. Substrates can be dipped in either a vertical or horizontal geometry.

# EQUIPMENT

## EQUIPMENT NAME:

**Corrosion Testing Apparatus for Salt Spray and Condensate Water Tests**

## PART OF:

CSSNT-UPB, Laboratory of electrochemical micro- and nanostructured coatings

**CATALOG NAMES: Corrosion Testing Apparatus, Model 606-Basic (400 L test chamber volume)**

**YEAR: 2015**

**PRODUCER : ERICHSEN Germany**

## DESCRIPTION:

There are many metallic materials and qualities on the market and their properties must be properly assessed. Materials intended to prevent corrosion must be tested if failures are to be avoided. Furthermore the comparative quality control during production is of increasing importance. The best known processes employ spray vapor tests using various salt solutions as well as condensation water climates.

The ERICHSEN Corrosion Testing Instrument, Model 606 is made of impact resistant, eco-friendly polypropylene material. It is equipped with an integrated control unit providing the necessary regulating and control instruments for temperature monitoring in the test chamber, the temperature of the humidifier, the spray pressure and the duration of the test. The test apparatus is ready for operation and able to perform continuous corrosion tests in accordance with DIN EN ISO 9227, DIN EN ISO 6270-2, DIN 53 167, ASTM B 117, ASTM B 368 T "CASS TEST", DEF 1053 Meth. 24, MIL-STD 202 B, PN X 41-002.



# EQUIPMENT

## EQUIPMENT NAME:

Humidity Cabinet **HYGROTHERM 519 FA**

## PART OF:

CSSNT-UPB, Laboratory of electrochemical micro- and nanostructured coatings

**CATALOG NAMES: HYGROTHERM 519**

**YEAR: 2015**

**PRODUCER : ERICHSEN Germany**



## DESCRIPTION:

Corrosion protection systems and materials are tested in the humidity cabinet **HYGROTHERM 519** in accordance with international standards and specifications, including DIN EN ISO 6270-2, DIN 50 018 (Kesternich Test). Examples are the reaction of protection-treated carrier media in the condensed water climate or the reaction of industrial finishes to sulphur dioxide containing atmospheres. For this purpose the specimens are exposed to aggressive climates or media for a specific period of time.

The **HYGROTHERM 519 FA** is a **fully automatic version** using a PLC (programmable logic control) for the automatic sequence, i. e., the control of heating, acid feeding and draining, filling of the bottom trough with water as well as draining, refilling of the trough water tank, and evacuation and replacement of air (manual operation also possible).