**Scanning electron microscope with electron lithography module** , **UV photolithographic instrument** , **magnetron sputtering device** , **microabrasive CNC lathe** **reactive ion** **etching station** , **microfluidic liquid sample delivering system**

**Equipment:** Laboratory of biosensors and microfluidics

**No. of Equipment: UJEP22**

**Responsible coordinator:** Mgr. Marcel Štofik, Ph.D., Mgr. Jan Malý, Ph.D.

**Name of Institution:** J. E. Purkyně University in Ústí nad Labem, Faculty of Science, Department of Biology

**Address of Institution:**  České mládeže 8, 400 96 Ústí nad Labem

**E-mail:** [marcel.stofik@ujep.cz](mailto:marcel.stofik@ujep.cz), malyjalga@seznam.cz

**Telephone:** +420 475283376

**Homepage:** http://www.ujep.cz

**Contact person:** Mgr. Marcel Štofik, Ph.D.

**E-mail:** [marcel.stofik@ujep.cz](mailto:marcel.stofik@ujep.cz)

**Telephone:** +420 475283376

**Equipment Description**

**Description of equipment:**

Complete infrastructure for the design, manufacturing and testing of biosensors and microfluidic devices for biomedical and environmental applications

Specifications and technical features:

*Scanning electron microscope with electron lithography module (Tescan), UV photolithographic instrument (Newport), magnetron sputtering device (Quorum), microabrasive CNC lathe (Comco), reactive ion etching station (Plasma Etch), microfluidic liquid sample delivering system (Elveflow)*

*Scanning electron microscope with electron lithography module (Tescan)*

Main features: Unique four-lens Wide Field Optics™ design offering the variety of working and displaying modes embodying the Tescan proprietary Intermediate Lens for the beam aperture optimization.

Electron optics working modes:

Resolution: automatically configures the column to produce the highest resolution for the chosen working conditions.

Depth: sets the column up in a mode that enhances depth of focus.

Field: optimizes the column to provide an extra large non-distorted field of view.

Fish-Eye: provides a “macro” view of the sample.

Rocking Beam: working mode for assessment of crystal orientation data of the specimen, acquiring of electron channeling pattern (ECP).

Resolution: 3 nm at 30 kV

Magnification: 13-1 000 000x in Resolution Mode at 30kV, min. Magnification in Fish Eye Mode: about 4x

Accelerating voltage: 200 V to 30 kV

Electron Gun: Tungsten heated cathode

Probe Current: 1 pA to 2 μA

Chamber: Internal Diameter: 230mm

Number of Ports: 11

Specimen Stage: Type: semi-compucentric

Movements: X = 40 mm – motorized (-20 mm to +20 mm)

Y = 40 mm – motorized (-10 mm to +30 mm)

Z = 47 mm – motorized

Rotation: 360° continuous – motorized

Tilt: manual: -75° to +50° from WD 15mm and for eucentric height of the specimen

Maximum specimen height: 60 mm

Detectors: SE - ET type (YAG Crystal)

LVSTD – Low Vacuum Secondary Tescan Detector

Retractable BSE - Retractable annular scintillator type (YAG Crystal) with high sensitivity and atomic number resolution (0.1)

TE - Detector

Probe Current Measurements, Touch Control

TV Camera for the „Chamber View“

Peltier Cooling stage

Beam Blanker

Chamber vacuum: < 1x10-2 Pa

Column vacuum: < 1x10-2 Pa

*UV photolithographic instrument (Newport)*

Flood Exposure Source: 1000 W Hg lamp cover near UV (350 - 450 nm), dichroic mirror and the collimating lens, automated exposure control by Digital Exposure Controller

Samples size: 4 x 4 inches, vacuum mask fixation tool

*Magnetron sputtering device (Quorum)*

Specifications: Q150T Turbo-Pumped Sputter Coater/Carbon Coater

Metal sputtering, carbon and metal evaporation.

Applications: sample preparation for high resolution scanning electron microscopy (SEM), carbon coating suitable for SEM, metal mask preparation for UV photolithography or reactive ion etching

Sample dimensions: up to 2 inches

*Microabrasive CNC lathe (Comco)*

Basic characteristics of system: The LA3250 Advanced Lathe is designed for the steady processing of precision parts in production environment. Using up to four axes of motion and unique tooling, the Advanced Lathe is able to process a wide range of applications. Among them, the maskless or micromachining of glass or silicon through mask for microfluidics development is possible.

Main features: Bright, easy-to-read touch screen display

Programming in industry-standard G-code

Quick change between different types of parts

Four axes of motion

Capable of handling complex part geometries

Quick disconnect tooling and vacuum chuck

Compatible with wide range of abrasive materials

*Reactive ion etching station (Plasma Etch)*

Basic characteristics of system: The PE-100 is a complete plasma treatment solution capable of reactive ion etching, plasma functionalization and more. The instrument is capable of 1) Plasma Cleaning/Plasma Etching; 2) Reactive Ion Etching (RIE) in both isotropic and anisotropic plasma processing. It is useful for RIE etching through mask and production of micro/nano patterns in silicon/glass substrates.

Main features: Electrode Configuration: Three Stacked Horizontal (9"Wx13"D + 3" Clearance)

Generator: 300W, 100KHz

Continuously Variable Power Supply

On board control system included for fully automatic system operation, process sequencing, multiple recipe storage, and other advanced features

Gas Control: One 0-50cc Mass Flow Controller

Vacuum Gauge: 1-2000 mT

Vacuum Pump: 8CFM 2-Stage Direct Drive Oil Pump with Oil Mist Coalescing Filter (Oxygen Service – Krytox Charged)

Chamber Material: 6061-T6 Aluminum

Chamber Dimensions: 12”x14.5”x12”

*Microfluidic liquid sample delivering system (Elveflow)*

Basic characteristics of system: System dedicated for pulsation free continuous delivery of liquid samples in precisely controlled flow rate into microfluidic chips based on piezoelectrically controlled valves and compressor generated positive pressure.

Main features: unit pressure: 0-2000 mbar

Pressure stability: 0.005 %

Sensor resolution: 0.006 %

Settling time: 40 ms

Response time: 9 ms

No. of channels: 4

**Specification of expertise relevant to NanoEnviCz workpackages:**

**WP8**a-c,e,f, **WP9**a-c, e

**Detailed description of expertise**

**Please, specify the main research topics connected with equipment**:

**Biosensing by new devices**

Microfluidic biosensors for biomedical applications

Cultivation of cells in microfluidic chips, development of novel technology for cell cultivation and cytotoxicity studies

**Please, specify the secondary research topics connected with equipment**:

Analysis of nanomaterials by SEM

Plasma modification of nanomaterials

Fabrication of nanostructured surfaces

**Keywords describing research area:**

Whole-cell biosensors, nanomaterials, microfluidics, nanostructured surfaces

**Competence**

**Relevance for applied and industrial research:**

Studying the application of novel detection strategies in biomedicine and environmental analysis

**Relevance for fundamental studies:**

Microfluidic devices for cell culturing and analysis

Microfluidic biosensors for biomedical applications