**Equipment:** Microarray printer

**No. of Equipment: UJEP 26**

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**Equipment Description**

**Description of equipment:**

Specifications and technical features:

Microarrayer is the printing technology to produce diverse DNA, protein, reverse phase and whole cell microarray content in personal desktop designs. It represents automated solution to innovative microarray research, genomics, proteomics and diagnostics, and is essential equipment for life science and healthcare related basic and application research.

Key technical parameters:

* 4-pin printhead configuration in a 2 x 2 pattern at 4.5 mm spacing
* Printhead for reduced friction and printing precision
* Axis resolution and repeatability of ±10 µm
* Deck which accommodates at least 14 standard glass substrate slides (25 x 76 mm)
* Deck which accommodates 1 microplate (384-well)
* Complete deck and microplate cooling/heating from 4°C - 45°C
* Humidity control from 10-80% RH
* At least 3,600 spots per sub-microarray (9 x 9 mm)
* At least 50,400 spots per entire substrate (18 x 63 mm)

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

*Please, tick relevant research topic(s).*

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| --- | --- |
| **WP3 SYNTHESIS AND DESIGN OF NEW MULTIFUNCTIONAL NANOMATERIALS FOR ENVIRONMENT PROTECTION** | |
| Conceptually new nanostructured materials with the potential for application in innovative technologies |  |
| Computer aided nanomaterials design |  |
| Low dimensional materials and their composites (carbon dots, nanotubes, graphene derivatives) |  |
| Nanofibers |  |
| Magnetic hybrids |  |
| Metal and metal oxide NPs |  |
| Redox active nanomaterials |  |
| Nanomaterials for biomedical applications | x |
|  | |
| **WP4 HETEROGENEOUS CATALYSIS FOR ENVIRONMENTAL PROTECTION** | |
| Nanomaterials for catalytic degradation of pollutants in water, soil and air |  |
| Nanostructured heterogeneous catalysts for abatement of pollutants from industrial processes and automotive transport |  |
| New “clean” catalytic processes for chemical production |  |
|  | |
| **WP5 NOVEL NANOMATERIALS AND TECHNOLOGIES FOR SUSTAINABLE PRODUCTION** | |
| Processes and technology for sustainable energy and chemical production |  |
| Catalytic processes for transformation of natural gas to liquids |  |
| Nanomaterials for utilization of renewables; Magnetically separable green catalysts |  |
|  | |
| **WP6 EFFECTIVE PHOTOCATALYTIC TECHNOLOGIES** | |
| Mastering nanomaterials for photocatalysis |  |
| Effective photocatalytic processes |  |
| Photovoltaic paints |  |
| Functional surfaces for environmental protection |  |
| Hybrid materials combining photocatalysts and heterogeneous catalysts |  |
| Thin photocatalytic films for direct solar splitting of water |  |
|  | |
| **WP7 NANOTECHNOLOGY FOR TRAPPING AND CHEMICAL DEGRADATION OF POLLUTANTS** | |
| Nanomaterials for sorption |  |
| Natural based nanomaterials produced by “green” technology |  |
| Reactive sorbents for degradation of pesticides and highly toxic agents |  |
| Degradation of chemical warfare agents |  |
| Analysis of filtering capabilities of nanomaterials |  |
| Elimination of radionuclides contamination |  |
| Modified nanofiber filters; Advanced antimicrobial filters/membranes |  |
| Nanoiron for groundwater and waste water treatment |  |
| Nano-trapping of heavy metals |  |
|  | |
| **WP8 SENSING AND MONITORING OF POLLUTANTS** | |
| Efficient sensing of pollutants |  |
| Biosensing by new devises | x |
| Application of new sensors in monitoring of pollutants |  |
| Magnetic sensors; Magnetically assisted SERS sensors |  |
| Advanced electrochemical sensors |  |
| Graphene based nanosensors |  |
|  | |
| **WP9 TOXICITY AND RISKS OF NANOMATERIALS** | |
| Health risks | x |
| Environmental risks | x |
| „In vitro“ and „in vivo“ toxicity tests – cytotoxicity, genotoxicity, interactions with membrane |  |
| RNA gene expression changes and protein expression changes | x |
| Complete eco/aquatoxicity ecotoxicity evaluation |  |
| Toxicity against bacteria and fungi |  |

**Detailed description of expertise**

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

**Health and environmental risks**

Protein and whole-cell biosensors

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

Nanomaterials for biomedical applications – development of novel signal amplification strategies

**Keywords describing research area:**

Microarrays, biosensors, proteins, nucleic acid, fluorescence, nanoparticles

**Competence**

**Relevance for applied and industrial research:**

Development of novel diagnostic approaches for environmental and biomedical applications

**Relevance for fundamental studies:**

Novel protein and whole-cell biosensors for environmental and biomedical applications

Nanomaterials for biomedical applications – development of novel signal amplification strategies

**Comments**

Instrument will be used for fabrication of active biosensor surfaces on glass or polymeric materials. It will enable to print a micrometer sized, high surface density spots from proteins, nucleic acids or cells on flat substrates under controlled conditions as are temperature or air humidity. Microarray printer will be used in combination with techniques recently available at UJEP (microfluidic fabrication, EBL and UV lithography etc.) for development of miniaturized highly parallel microfluidic optical biosensor devices for environmental or biomedical diagnostic applications. Thus, the existing competences of RI in the area of biosensors development will be greatly enhanced. It will also open further possibilities for application oriented research and contracted research which will be opened for partners of infrastructure consortium.