**Equipment MicroWriter**

completed by responsible coordinator of equipment

**Equipment: MicroWriter**

**No. of Equipment:** UFCH25

**Responsible coordinator: Mgr. Otakar Frank, Ph.D.**

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**Equipment Description**

MicroWriter ML3 Pro (Durham MagnetoOptics Ltd.) is a direct-write photolithography machine for rapid prototyping in R&D laboratories and small clean rooms. It is compatible with most photolithography resists (385 nm), minimum feature size is 400 nm.

Key parameters:

* 195mm x 195mm maximum writing area
* 0.4um minimum feature size
* 385nm long-life semiconductor light source, suitable for broadband, g-, h- and i-line positive and negative photoresists (e.g. S1800, ECI-3000, MiR 701, SU-8)
* XY interferometer with 1nm resolution for precise motion control
* Extremely fast writing speed – up to: 17mm2/minute (0.6µm minimum feature size)
* Grey scale exposure mode for 3-dimensional patterning (255 grey levels)
* Built-in 2-dimensional optical surface profiler (100nm thickness resolution)
* Virtual mask aligner mode in which the pattern to be exposed is displayed on top of the real-time microscope image, allowing the machine to be used like a traditional mask aligner.

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

|  |  |
| --- | --- |
| **WP3 SYNTHESIS AND DESIGN OF NEW MULTIFUNCTIONAL NANOMATERIALS FOR ENVIRONMENT PROTECTION** | |
| Conceptually new nanostructured materials with the potential for application in innovative technologies | X |
| Computer aided nanomaterials design | X |
| Low dimensional materials and their composites (carbon dots, nanotubes, graphene derivatives) | X |
| Nanofibers |  |
| Magnetic hybrids | X |
| Metal and metal oxide NPs | X |
| Redox active nanomaterials | X |
| 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 |  |
| Application of new sensors in monitoring of pollutants | X |
| Magnetic sensors; Magnetically assisted SERS sensors | X |
| Advanced electrochemical sensors | X |
| Graphene based nanosensors | X |
|  | |
| **WP9 TOXICITY AND RISKS OF NANOMATERIALS** | |
| Health risks |  |
| Environmental risks |  |
| „In vitro“ and „in vivo“ toxicity tests – cytotoxicity, genotoxicity, interactions with membrane |  |
| RNA gene expression changes and protein expression changes |  |
| Complete eco/aquatoxicity ecotoxicity evaluation |  |
| Toxicity against bacteria and fungi |  |

**Detailed description of expertise**

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

The equipment is best suited for designing and prototyping of new multifunctional nanomaterials.

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

Sensing and monitoring of pollutuants.

**Keywords describing research area:**

**mask-less lithography, microscale devices**

**Competence**

**Relevance for applied and industrial research:**

The equipment is an ideal tool for prototyping of new microscale devices, before high-throughput production methods (mask lithography) can be utilized and established.

**Relevance for fundamental studies:**

The controlled creation of devices, incl. the interconnects with defined dimensions, is critical for a correct evaluation of new data acquired to understand the function of such devices. The possibilities of very small chip size and resolution offered by the equipment are indispensable in this sense.

**Comments**