**XRD miniFlex 600**

**Equipment:** *XRD miniFlex 600*

**No. of Equipment:** *TUL16*

**Responsible coordinator:** doc. RNDr. Michal Řezanka, Ph.D.

**Name of Institution:** Technical University of Liberec

**Address of Institution:** Studentská 1402/2, 461 17 Liberec

**E-mail:** michal.rezanka@tul.cz

**Telephone:** +420 485 353 445

**Homepage:** cxi.tul.cz

**Contact person:** operator Ing. Martin Palušák

**E-mail:** martin.palusak@tul.cz

**Telephone: +**420 602 713 654

**Equipment Description**

The MiniFlex benchtop X-ray diffractometer is a multipurpose powder diffraction analytical instrument that can determine: crystalline phase identification (phase ID) and quantification, percent (%) crystallinity, crystallite size and strain, lattice parameter refinement, Rietveld refinement, and molecular structure.

**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 |  |
| Computer aided nanomaterials design |  |
| Low dimensional materials and their composites (carbon dots, nanotubes, graphene derivatives) | x |
| Nanofibers |  |
| Magnetic hybrids |  |
| Metal and metal oxide NPs | x |
| Redox active nanomaterials | x |
| Nanomaterials for biomedical applications |  |
|  | |
| **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 | x |
| Natural based nanomaterials produced by “green” technology |  |
| Reactive sorbents for degradation of pesticides and highly toxic agents |  |
| Degradation of chemical warfare agents | x |
| 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 | x |
|  | |
| **WP8 SENSING AND MONITORING OF POLLUTANTS** | |
| Efficient sensing of pollutants |  |
| Biosensing by new devises |  |
| Application of new sensors in monitoring of pollutants |  |
| Magnetic sensors; Magnetically assisted SERS sensors |  |
| Advanced electrochemical sensors |  |
| Graphene based nanosensors | x |
|  | |
| **WP9 TOXICITY AND RISKS OF NANOMATERIALS** | |
| Health risks |  |
| Environmental risks | x |
| „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**:

*XRD miniFlex 600* can be used for:

* Crystalline phase identification
* Phase quantification
* Percent (%) crystallinity
* Crystallite size

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

* Verification of purity
* Analysis of material change over time or different conditions

**Keywords describing research area:**

Crystallography, Phase analysis, X-ray diffraction, Structural analysis, Crystal lattice, Materials research, Mineral identification

**Competence**

**Relevance for applied and industrial research:**

This equipment (commonly used at TUL) allows the study of crystal structures, phase composition and properties of materials. The instrument is also capable of quantifying the phases in the sample and the purity of the material

**Relevance for fundamental studies:**

The instrument can be used to identify phases, refine the structure and verify crystal lattice parameters, allowing advanced characterization of materials.

**Comments**

The guest user can use the device independently under the operator's supervision or as custom analyses wholly performed by the operator.