**FTIR spectrometer with FTIR microscope and FT-Raman module**

**Equipment: Nicolet iS50 FTIR spectrometer, FTIR microscope Nicolet RaptIR+, iS50 FT-Raman module**

**No. of Equipment: TUL 3**

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

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**Equipment Description**

Infrared and Raman spectroscopy. Chemical composition and structure, identification of organic functional groups or unknown materials, monitoring of changes and defects in materials, characterization of inhomogeneous materials.

**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 |  |
| Low dimensional materials and their composites (carbon dots, nanotubes, graphene derivatives) | x |
| Nanofibers | x |
| Magnetic hybrids | x |
| Metal and metal oxide NPs | x |
| 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 | x |
| Nanostructured heterogeneous catalysts for abatement of pollutants from industrial processes and automotive transport | x |
| New “clean” catalytic processes for chemical production | x |
|  | |
| **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 | x |
|  | |
| **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 | x |
|  | |
| **WP7 NANOTECHNOLOGY FOR TRAPPING AND CHEMICAL DEGRADATION OF POLLUTANTS** | |
| Nanomaterials for sorption | x |
| Natural based nanomaterials produced by “green” technology | x |
| Reactive sorbents for degradation of pesticides and highly toxic agents | x |
| Degradation of chemical warfare agents |  |
| Analysis of filtering capabilities of nanomaterials |  |
| Elimination of radionuclides contamination |  |
| Modified nanofiber filters; Advanced antimicrobial filters/membranes | x |
| 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 |  |
| Magnetic sensors; Magnetically assisted SERS sensors |  |
| Advanced electrochemical sensors |  |
| Graphene based nanosensors |  |
|  | |
| **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**:

Any studies concerning changes or identification of chemical structures, particularly of organic substances. Based on the spectra obtained, organic functional groups or changes in structure are identified by comparing materials with each other. The identification of unknown materials is based on spectral comparison with available library spectra of materials.

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

**Keywords describing research area:**

FTIR spectroscopy, Raman spectroscopy, ATR, spectra, chemical structure

**Competence**

**Relevance for applied and industrial research:**

This device is typically used to study the chemical structure of organic substances or materials, nanofiber materials, particles, or their modifications.

**Relevance for fundamental studies:**

Spectroscopic methods enable the study of the chemical composition and modifications of (new) materials and their mutual comparison.

**Comments**