**Infrared Spectrometer**

completed by responsible coordinator of equipment

**Equipment:**

**No. of Equipment:** UFCH23

**Responsible coordinator:** Dr. Petr Sazama

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**Equipment Description**

**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) |  |
| Nanofibers | x |
| 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 | 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 | x |
| Catalytic processes for transformation of natural gas to liquids | x |
| Nanomaterials for utilization of renewables; Magnetically separable green catalysts | x |
|  |
| **WP6 EFFECTIVE PHOTOCATALYTIC TECHNOLOGIES** |
| Mastering nanomaterials for photocatalysis | x |
| Effective photocatalytic processes |  |
| Photovoltaic paints |  |
| Functional surfaces for environmental protection | x |
| Hybrid materials combining photocatalysts and heterogeneous catalysts | x |
| 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 | 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 | x |
| 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 | x |
| 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**:

The Nicolet iS50 is the scientific infrared spectrometer for universal material analysis. The spectrometer is primarily used to identify the structure of materials for heterogeneous catalytic and adsorption processes for environmental protection and for catalytic technologies.

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

Spectral analysis providing a detailed view of the structure of adsorption centers and functional groups in nanostructured materials.

**Keywords describing research area:**

FTIR spectroscopy, structural analysis, nanostructured materials, catalysis, adsorption

**Competence**

**Relevance for applied and industrial research:**

Characteristic infrared bands of vibrations of the studied materials and adsorbed molecular probes are primarily used to determine the concentration, structure, nature and availability of active centers in nanostructured heterogeneous catalysts and adsorption sites in adsorption materials.

**Relevance for fundamental studies:**

The identification of the structure of nanostructured catalysts and adsorption materials serve to find correlations with their functional properties in heterogeneously catalyzed reactions and adsorption processes used for the degradation of pollutants in water, soil and air and in new "pure" catalytic processes usable for chemical production. A detailed view of the structure of functional groups in materials.

**Comments**