**FTIR spektrometr s příslušenstvím**

*(completed by the responsible coordinator of equipment)*

**Equipment: *equipment*** *FTIR spektrometr s příslušenstvím, fa NICOLET* ***(Pro-NanoEnviCz III)***

**No. of Equipment:** replacement for the UACH 8

**Responsible coordinator:** Dr. Petra Ecorchard

**Name of Institution:** Institute of Inorganic Chemistry of the Czech Academy of Sciences

**Address of Institution:** 250 68 Husinec-Řež č.p. 1001, Czech Republic

**E-mail:** ecorchard@iic.cas.cz

**Telephone:** +420 311236922

**Homepage:** https://www.iic.cas.cz/en/

**Contact person:** Dr. Jiří Henych, Dr. Petra Ecorchard

**E-mail:** henych@iic.cas.cz, ecorchard@iic.cas.cz

**Telephone:** +420 311236935

**Equipment Description**

The FT-IR spectrometer Nicolet iS50 for determination of the molecular structure of the chemical compounds, in-situ observation of the adsorption, surface chemical and photochemical reactions.

Measurement of the solid powder samples, thin films and liquid samples, transmission mode and ATR crystal.

**Specifications and technical features:**

Spectral range: 100 - 4000 cm-1  
Single reflection attenuated total reflection (ATR) Diamant, Ge, ZnSe crystal

Wafers for trasmission measurements - ZnSe, Si, Sapphire, KBr.

Possible measurement with KBr tablets, measurements of liquids

Praying MantisTM High temperature reaction chamber - diffuse reflectance tool for studying heterogeneous catalysis, gas-solid interactions, photochemical reactions, and oxidation mechanisms. The High Temperature Reaction Chamber is well suited for performing such studies under carefully controlled temperatures and pressures.

**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 |  |
| Metal and metal oxide NPs | X |
| Redox active nanomaterials |  |
| 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 |  |
|  | |
| **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 | X |
| Effective photocatalytic processes |  |
| Photovoltaic paints | X |
| Functional surfaces for environmental protection | X |
| 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 |  |
| 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 | 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**:

1) Determination of the molecular structure of the new synthesised chemical compounds.

2) In-situ observation of the adsorption and surface chemical reactions - reactive adsorption of the warfare agents simulants (DMMP, TMP, CEES, TEP) or pesticides on the surfaces of powdered samples (TiO2, CeO2, ZrO, etc.)

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

The observation of the photochemical reactions of the model compounds (liquid, gas) on the surfaces of the powder samples.

**Keywords describing research area:**

Qualitative analysis, surface chemical reactions, sorption, warfare agents degradation, photocatalysis

**Competence**

**Relevance for applied and industrial research:**

Fast nondestructive qualitative analysis of the various chemical compounds.  
Testing of the materials reactivity towards various toxic compounds such as organophosphorus pesticides, civil warfare agents’ simulants.

**Relevance for fundamental studies:**

Determination of the molecular structure of the prepared compounds.

Study of the mechanism of the adsorption, surface chemical reactions, and photocatalysis.

**Comments**