**NUCLEAR MAGNETIC RESONANCE**

*(completed by the responsible coordinator of equipment)*

**Equipment: *equipment*** JEOL 400 MHz JNM ECZ-400R/M1

**No. of Equipment:** *UJEP 41*

**Responsible coordinator**: Prof. Pavla Čapková, DrSc

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**Equipment Description**

JEOL 400MHz NMR spectrometer JNM-ECZ400R/M1 with JASTEC 400/54/JJYH/W superconducting magnet (9.39T, 54 mm standard bore), with auto-tuning and adjustment for all cores in the probe range for liquid (High Sensitivity ROYALPROBE HXF) and solid samples (3.2 mm High Resolution 400 MHz AutoMAS probe), with programmable auto-dispenser for up to 30 liquid or solid samples.

**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 | YES |
| Computer aided nanomaterials design |  |
| Low dimensional materials and their composites (carbon dots, nanotubes, graphene derivatives) |  |
| Nanofibers |  |
| Magnetic hybrids |  |
| Metal and metal oxide NPs | YES |
| Redox active nanomaterials | YES |
| 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 | YES |
|  |
| **WP5 NOVEL NANOMATERIALS AND TECHNOLOGIES FOR SUSTAINABLE PRODUCTION** |
| Processes and technology for sustainable energy and chemical production | YES |
| Catalytic processes for transformation of natural gas to liquids | YES |
| Nanomaterials for utilization of renewables; Magnetically separable green catalysts | YES |
|  |
| **WP6 EFFECTIVE PHOTOCATALYTIC TECHNOLOGIES** |
| Mastering nanomaterials for photocatalysis | YES |
| 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 | YES |
| Elimination of radionuclides contamination | YES |
| Modified nanofiber filters; Advanced antimicrobial filters/membranes |  |
| Nanoiron for groundwater and waste water treatment |  |
| Nano-trapping of heavy metals | YES |
|  |
| **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**:

Homogeneous and heterogeneous inorganic super/acid catalysts and sorbents.

Competitive methods of some essential drugs production.

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

Desiccation of solid electrolytes. Selective heteroborane antibiotics.

**Keywords describing research area:**

catalysis – super-acid – borane - carborane – desiccation – acidity function

**Competence**

**Relevance for applied and industrial research:**

Quantitative 1H determination of water, solvents etc. NMR finger-print comparation.

13C NMR determination of the acidity function.

**Relevance for fundamental studies:**

Structural and quantitative 400 MHz NMR in liquid and solid state of organic, inorganic compounds, ceramics, polymers, electrolytes, alumosilicates … (1H, 2H, 19F, 13C, 10B, 11B, 7Li, 29Si, 27Al, 31P, 117Sn, 119Sn, 23Na, 15N…)

**Comments**