

CXI TUL





Structure of research at CXI

- ⋮ three progressive research directions
- ⋮ differences in scientific focus and expertise; however, mutual cooperation
- ⋮ each research direction lead by guarantor

Structure of research at CXI



NANOMATERIALS IN NATURAL SCIENCES



COMPETITIVE ENGINEERING



SYSTEM INTEGRATION



RESEARCH DIRECTIONS

CXI DIRECTOR
Miroslav Cernik

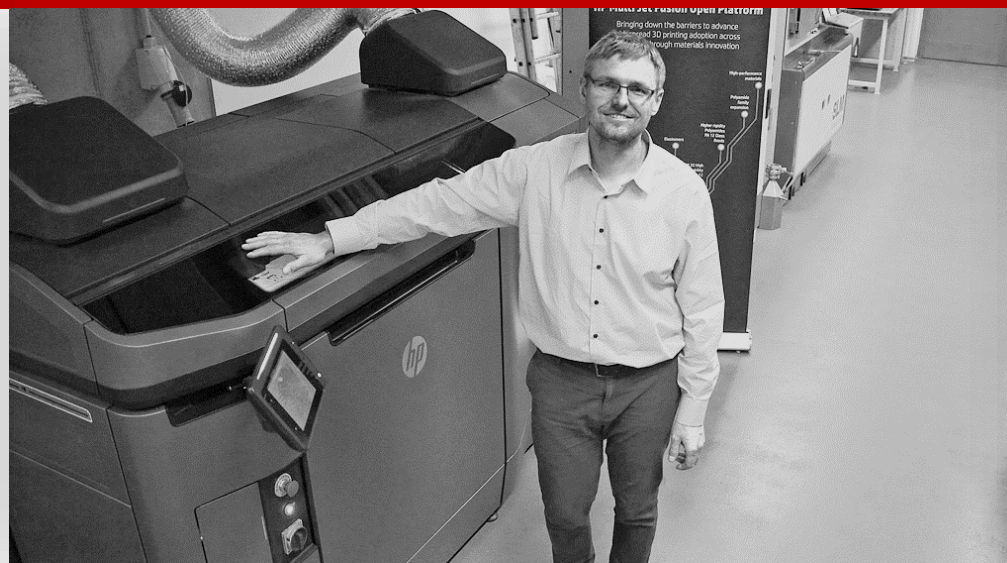


RESEARCH DIRECTOR
Michal Petru



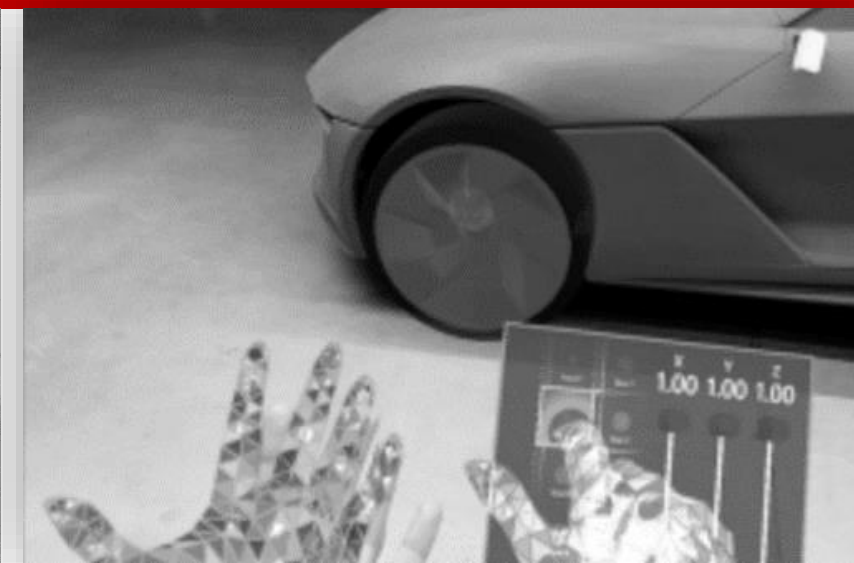
**NANOMATERIALS
IN NATURAL
SCIENCES (RD1)**

Lukas Dvorak



**COMPETITIVE
ENGINEERING
(RD2)**

Jiri Safka



**SYSTEM
INTEGRATION
(RD3)**

Jan Koci



NANOMATERIALS IN NATURAL SCIENCES



DEPARTMENT OF
NANOCHEMISTRY



DEPARTMENT OF
ENVIRONMENTAL
TECHNOLOGY



DEPARTMENT OF
APPLIED BIOLOGY



DEPARTMENT OF
ENVIRONMENTAL
CHEMISTRY

The research direction of nanomaterials in natural sciences combines basic research, technology and construction of pilot and professional biomass carriers, purification and analysis of environmental contaminants and testing of nanomaterials.



COMPETITIVE ENGINEERING



DEPARTMENT OF
3D TECHNOLOGIES



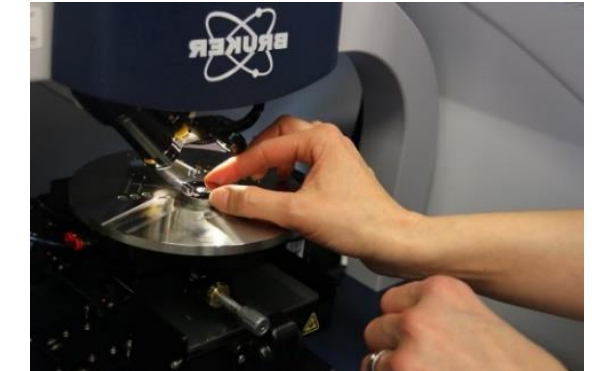
DEPARTMENT OF
VEHICLES



DEPARTMENT OF
MACHINES DESIGN



DEPARTMENT OF
ADVANCED
TECHNOLOGIES

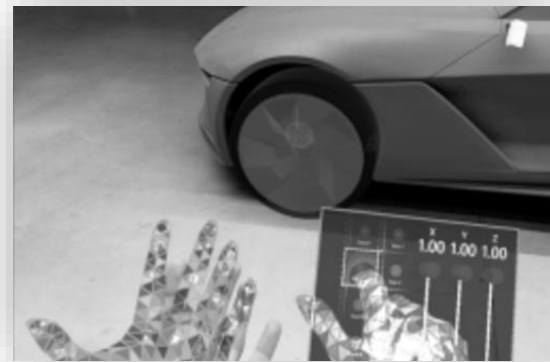


DEPARTMENT OF
ADVANCED MATERIALS

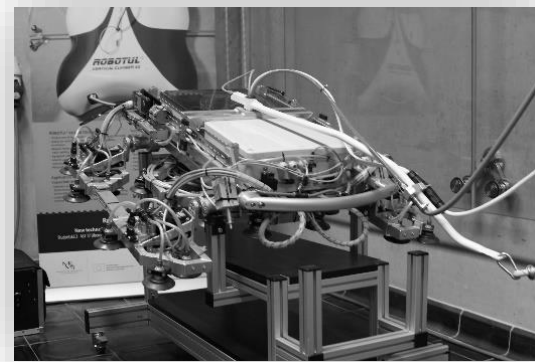
The research direction of competitive engineering combines research and development in the areas of manufacturing and the automotive industry with great application potential. The workplaces support the industrial activities of companies not just in the close-by regions and focus on the application of new technologies and technological procedures to ensure a higher degree of innovation in industrial production.



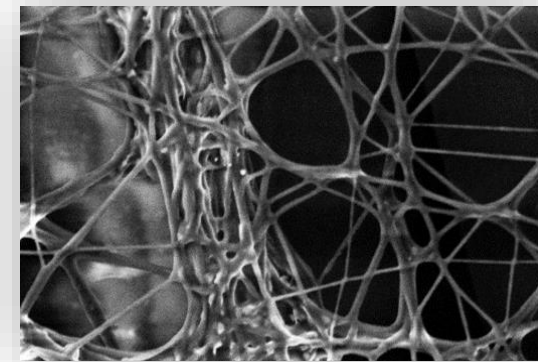
SYSTEM INTEGRATION



DEPARTMENT OF
SW ARCHITECTURE
AND DEVELOPMENT



DEPARTMENT OF
MECHATRONIC SYSTEMS
AND ROBOTICS



DEPARTMENT OF
PROCESS MODELING & AI



DEPARTMENT OF
PHYSICAL
MEASUREMENTS

Focus on research and development of modern software solutions, system solutions for data processing and integration between systems, and the provision of communication interfaces. An integral part is the field of robotics, including the use of collaborative or sensitive robots. The emphasis is being put on the introduction of state-of-the-art elements of visualization and projection of measured data, including the use of MR/AR.



CXI competence fields



Autonomous systems

autonomous and cooperative systems
autonomous utility electrovehicle

Additive manufacturing

3D printing including metallic prints and
reinforcing by advanced materials

Green technologies, up-scaling

environmental friendly products, piloting
of technologies

Environmental protection

(waste) water and groundwater treatment,
waste disposal, air filtration

Risk of nanomaterials, high-tech analysis

environmental risk of nanomaterials, advanced
analytical techniques

Advanced materials and machines design

the new light-weight and sustainable components,
innovative design and systematic planning of technical
systems innovations

Augmented reality

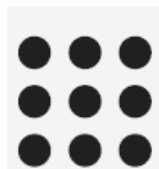
collaboration & remote assistance, mixed reality
wearables

BIG DATA, artificial intelligence

big data storage and analysis, machine learning & AI,
image and pattern recognition

Industrial IoT

advanced sensors, displays, edge and cloud computing,
5G and SigFox networks



RESEARCH DIRECTIONS



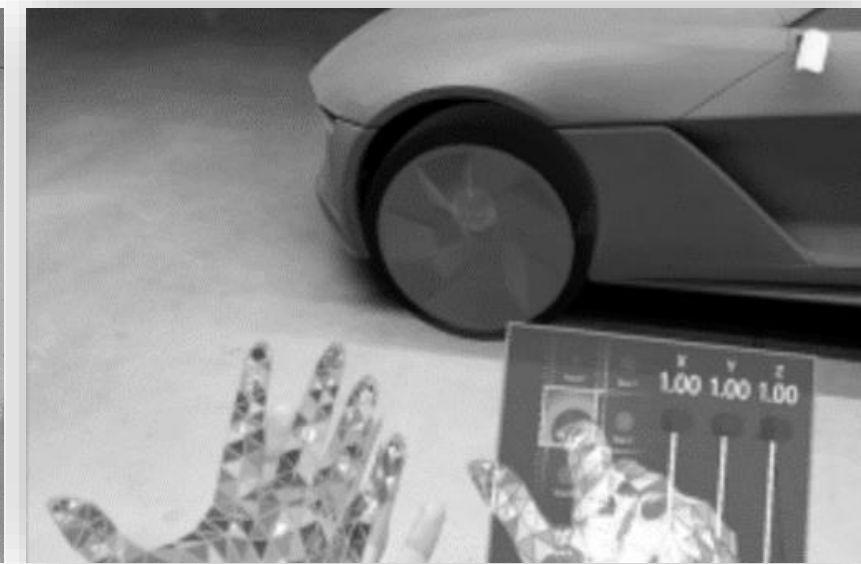
NANOMATERIALS IN NATURAL SCIENCES (RD1)

Lukas Dvorak



COMPETITIVE ENGINEERING (RD2)

Jiri Safka



SYSTEM INTEGRATION (RD3)

Jan Koci



FOCUS OF RD2

“The Research Direction” focuses on R&D of new materials, parts, systems and designs with great application potential for the manufacturing, manufacturing, automotive industries.

The focus in recent years has been both on the development and production of machinery, equipment and means of transport, and on the application of new technologies and technological processes to ensure a higher degree of industrial production innovation with regard to industry 4.0.



FOCUS OF RD2

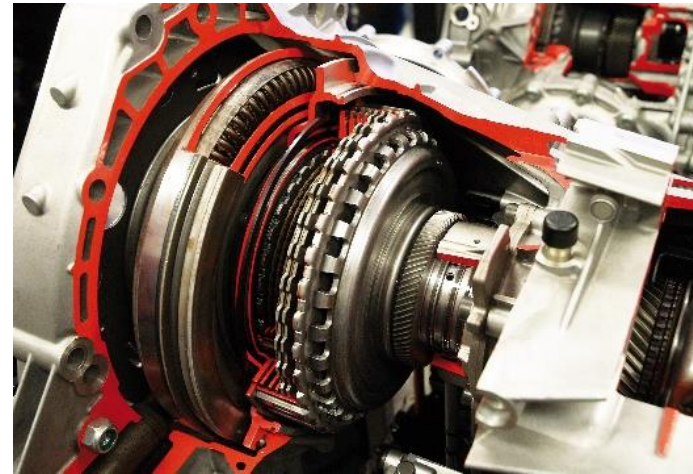
Research Direction Laboratory Workplaces, which of four departments are focused on the introduction of advanced technologies into the development of machinery and equipment, Complex solutions to specific problems from engineering and technology, materials research.



Departments of RD2



DEPARTMENT
OF 3D TECHNOLOGIES



DEPARTMENT
OF VEHICLES



DEPARTMENT OF
MACHINES DESIGN



DEPARTMENT OF
ADVANCED TECHNOLOGIES



DEPARTMENT OF
ADVANCED MATERIALS

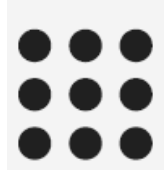
The research direction of **competitive engineering** combines research and development in the areas of manufacturing and the automotive industry with great application potential. The workplaces support the industrial activities of companies not just in the close-by regions and focus on the application of new technologies and technological procedures to ensure a higher degree of innovation in industrial production.



Ing. Jiří Šafka, Ph.D.

Guarantor of research
direction Competitive
Engineering and
Department of 3D
Technologies

DEPARTMENT OF 3D TECHNOLOGIES



MAIN RESEARCH ACTIVITIES

- Advanced research in specialized additive technologies
- Comprehensive activities include not only 3D printing using the most appropriate technology concerning the material to be processed and the targeted product properties but also data preparation, optimization of product geometries or their elements (topological optimization), post-processing operations and the development of new sustainable materials for additive technologies
- Investigating different technological approaches to accuracy, and quality of output parts to increase application possibilities and usability of 3D printed products

COOPERATION

- Research and development of 3D printing technologies
- Design of application-specific 3D printing components and topological optimization
- New 3D printing applications in plastics and metals
- Development of new sustainable materials for 3D printing technologies

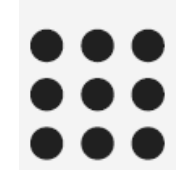




Ing. Robert Voženílek, Ph.D.

Department of Vehicles

DEPARTMENT OF VEHICLES



MAIN RESEARCH ACTIVITIES

- Powertrain development and testing
- Research and development in the field of electromobility
- Autonomous vehicle research and development



COOPERATION

- Development and construction of complete special test facilities and vehicles
- Testing of power units according to regulations and standards
- Mechanical and electrical design and manufacture

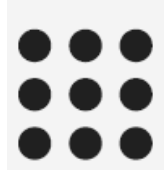




**doc. Dr. Ing.
Ivan Mašín**

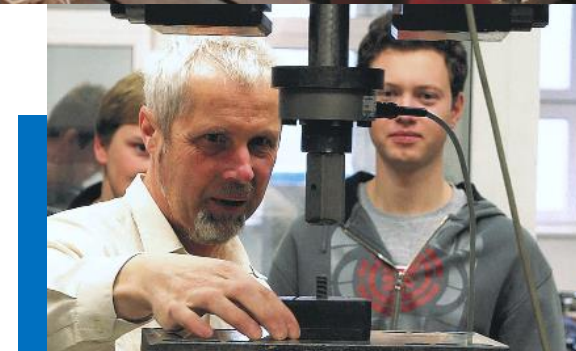
Department of
Machines Design

DEPARTMENT OF MACHINES DESIGN



MAIN RESEARCH ACTIVITIES

- Human safety and comfort in vehicles (land, air, water)
- Testing of new concepts and constructions of parts of mobile means of transport
- Mechatronic systems with active regulation



COOPERATION

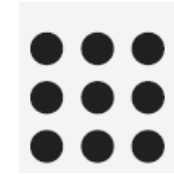
- Custom machine design
- Measurement of physical properties of active and passive vibration-insulating materials
- Implementation of advanced technologies for product and equipment development using new procedures and methods



Ing. Jiří Bobek, Ph.D.

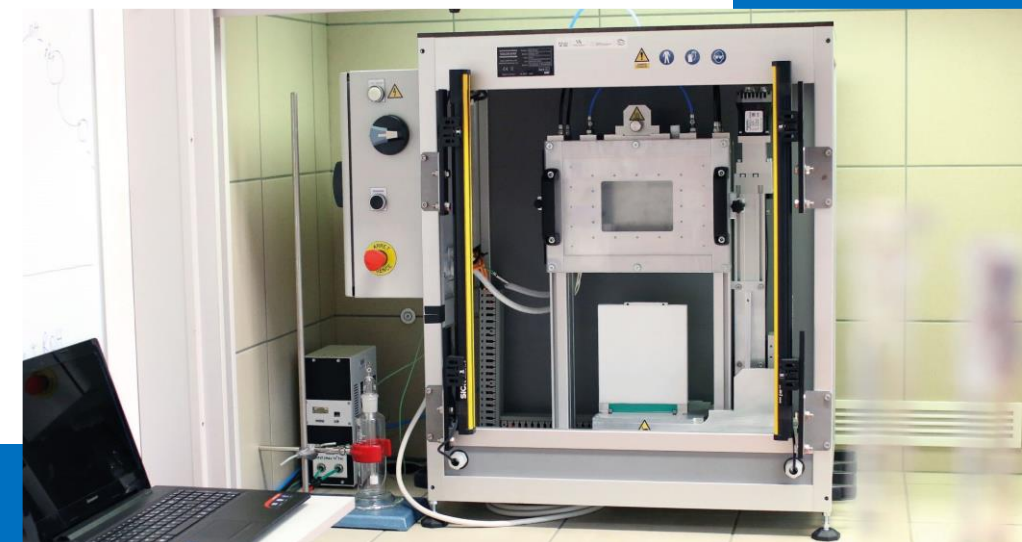
Department of
Advanced Technologies

DEPARTMENT OF ADVANCED TECHNOLOGIES



MAIN RESEARCH ACTIVITIES

- Development, research, innovation and application of progressive non-chip technologies for processing plastics, composites, metals and non-ferrous metals (casting, welding, forming and processing of plastics and composites)
- Parametrization of technological processes, optimization of processes with regard to efficiency, economy and the environment



COOPERATION

- Measurement of technological parameters during machining with defined and undefined cutting edge geometry
- Highly specialized measurements with unique devices
- Research, innovation and application of progressive technologies

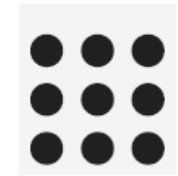




**Ing. Mateusz
Fijalkowski, Ph.D.**

Department of
Advanced Materials

DEPARTMENT OF ADVANCED MATERIALS

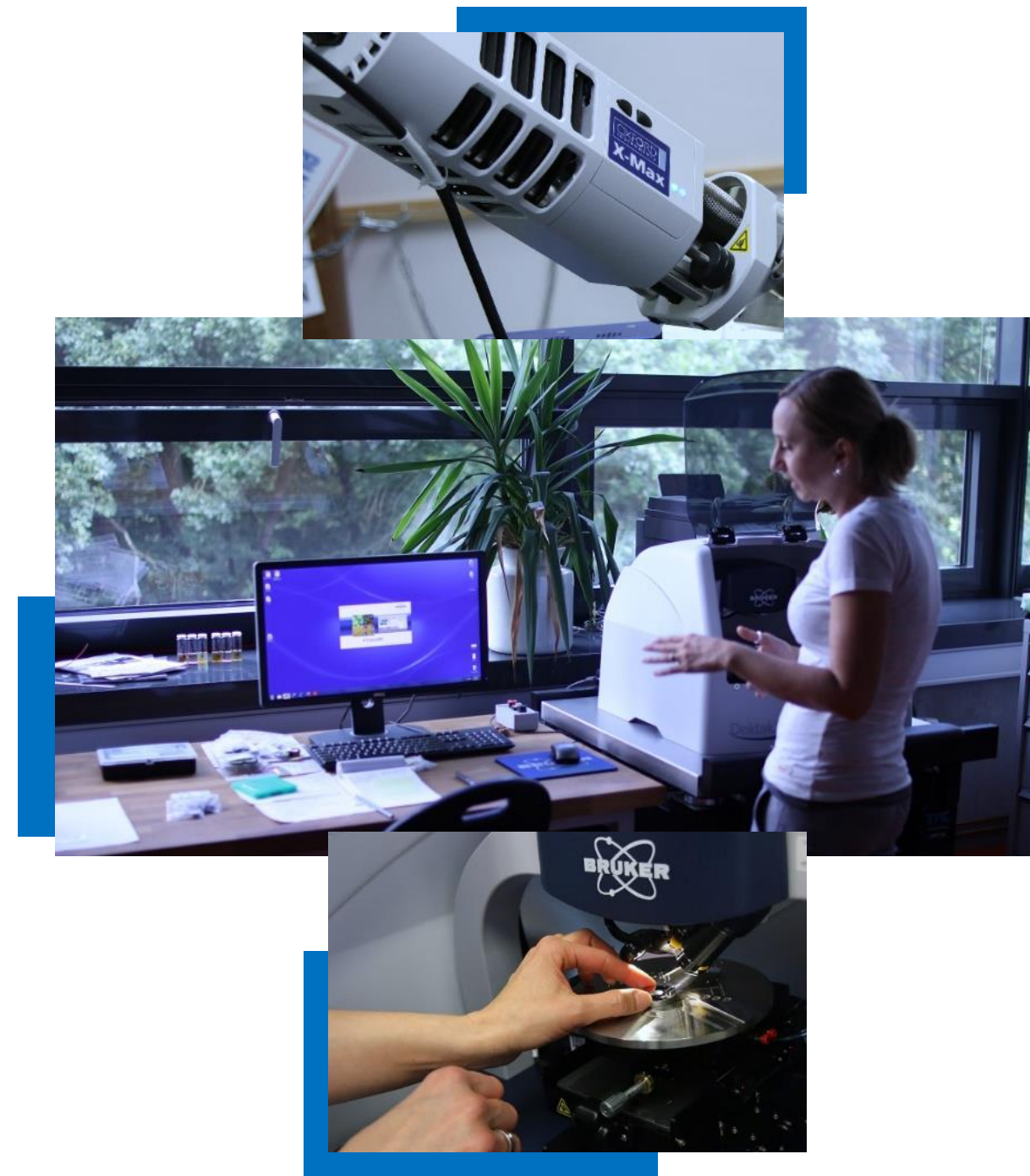


MAIN RESEARCH ACTIVITIES

- Research and development in the field of deposition of new types of thin films formed by plasma methods for specific applications
- Surface treatments and functionalization of materials using chemical formulations and plasma methods
- Research and development of detection systems based on functional nanostructures
- Preparation and application of nanoparticle systems, synthesis by combinatorial chemistry

COOPERATION

- Comprehensive analysis of all types of materials, including local chemical and crystallographic analysis for structural characterization and phase identification
- Materials research focused on the development of unconventional nanostructures with a high degree of functionality, the study of these materials and the search for new areas of application
- Industrial and development consultancy, expert support in solving manufacturing and technological problems, analysis of the causes of manufacturing problems or product defects





INSTITUTE FOR NANOMATERIALS,
ADVANCED TECHNOLOGIES
AND INNOVATION TUL

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Research on the Top