

This paper was created within the frame of the international project **Creation of international scientific team and participation in scientific networks in the field of nanotechnologies and unconventional forming of materials CZ.1.07/2.3.00/20.0038**, which was co-financed by the European Social Fund and the National budget of the Czech Republic.



Nanoteam VSB – TU Ostrava

CZ.1.07/2.3.00/20.0038

Strategy of project "Nanoteam VSB – TU Ostrava"

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Administrative team:	The main manager – prof. Ing. Stanislav Rusz, CSc.		
	Project Coordinator – Ing. Jan Kedroň		
	Financial Manager – Ing. Stanislav Tylšar		

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INVESTMENTS IN EDUCATION DEVELOPMENT **1. PRESENTATION OF THE PROJECT "NANOTEAM VSB – TU OSTRAVA"**

Project "Creation of an international scientific team and participation in scientific networks in the field of nanotechnologies and unconventional forming of materials" was launched on 1st June 2011 by the project applicant VŠB - Technical University of Ostrava, which was already involved in numerous European projects and had experience with the implementation and management of such projects. The company COMTES FHT a.s. with extensive experience as investigator or co-investigator of international projects dealing with applied research of materials, their forming and heat treatment, became the main partner of the project. It had also very good results in the field of educational scientific and research projects.

The project "NANOTEAM VŠB - TU Ostrava" throughout the whole period of its realisation beginning from 2011 dealt with creation of a successful international scientific team that would be able to actively participate in other international projects in the field of nanotechnologies and unconventional forming of materials. The crucial and leading role in the project was played mainly by the scientists from the Technical University of Ostrava and project partners from the company COMTES FHT a.s.

The project also involved leading experts in the fields of development of technology for production of ultra-fine-grained and nano metallic materials, both from research and development institutions in the Czech Republic, as well as prominent scientists from abroad. The main project objective was to create a strong international cooperation and to prepare the team for participation in international projects. The need for realisation of this project was given by the development of new knowledge in the area of development of the aforementioned technologies and their possible applications in industrial practice. All findings and knowledge obtained during building of the international team were in the course of solution of the project simultaneously transmitted to all target groups through professional discussion forums, workshops, seminars and also by direct access to the teaching courses.

Project partial objectives:

- Building of a team of experts
- Training of the team in the pertinent areas
- Creation of courses and trainings for professional staff
- Organisation of workshops, professional discussion forums, seminars and conferences
- Creation of an information portal



- Increase of success in applications for international scientific projects
- Participation in international cooperation in research

By creation of a successful scientific research team, we want to address the issue of very low success in involvement and solution of projects at the international level in the field of research of technologies for production of ultra-fine-grained and nano materials and non-conventional forming processes.

Target Gross of the project:

The main target group of the project "NANOTEAM VSB - TU Ostrava" were students and staff of the VŠB - TU Ostrava, at the Faculty of Engineering and the Faculty of Metallurgy and Materials Engineering, as well as students and staff of the University of West Bohemia, Faculty of Mechanical Engineering.

Both these groups were and are relatively narrowly focused on technological and development companies in the field of engineering, which cannot successfully exist without specific knowledge in the form of organisation of scientific and research teams and without preparation of international projects, which from the perspective of teacher can be used for scientific activities and also implemented into study programs. From the viewpoint of students they can be utilised within their skills and abilities in practice and the may increase their competitiveness.

Individual groups needed to gain contacts and links to the research teams, in which they could perform the mentioned activities, such as internships, gaining of expertise by functioning within the teams, so that they could pass on their skills and experience; they could present the experience gained and had at the same time a feedback directly from the industrial sector.



Logo of the project CZ.1.07/2.3.00/20.0038 "Nanoteam VSB – TU Ostrava"



2. PRESENTATION OF WORKING SITES INVOLVED IN THE PROJECT

2.1 VSB – Technical university of Ostrava

VSB – Technical university of Ostrava, 17. listopadu 15/2172, Ostrava – Poruba 708 33, T: +420 59 732 1111, www.vsb.cz

VSB – TU Ostrava heads towards the leading Czech and European universities offering technical and economic education, providing applied and basic research as well as necessary specialist advisory, consulting and expertise service to the industry, banking and business sector, including the offer of lifelong education.

VSB – TU Ostrava is part of the system of universities as the highest level of the education system of the Czech Republic. It is a university with focus on technology and economics, the main tasks of which are the following:

- Provide university level education;
- Develop research and development;
- Develop collaboration with the practice.

It has right to confer academic degrees, scientific degrees and academic title "doctor honoris causa". Parts of the VSB – TU Ostrava cooperate with the government agencies, local government, national and international universities, scientific institutions, organisations and individuals. Scientific and research activities belong to the main activities of the university and they are crucial for the successful restructuring of the Moravian-Silesian region. VSB – TU Ostrava belongs to the top technical universities in the Czech Republic, the scientific research and development potential of which develops and creates an important part of innovative activities of the Moravian-Silesian Region and of the Czech Republic. Results and evaluation of VSB-TU Ostrava evidence the strength of its professional human capital.

VSB – TUO collaborates with the largest companies in the region and in participates at solution of difficult tasks in the field of research and development, often directly in these companies. VSB – TUO also successfully develops cooperation with foreign universities and companies. It is an active member of numerous Czech and international organisations, including cluster associations. Collaboration with corporations and companies is realised mainly by individual faculties, which strive not only to ensure an active involvement of students directly into practice in these companies, but which are also involved in solution of variety of application problems.



Presentation of the working site VSB – TU of Ostrava, Department of mechanical technology 345

History of the Department is related to the formation of the Faculty of Mining Engineering and Department of operation economics in 1951, which provided teaching of technological subjects under the guidance of prof. Ing. Josef Parýzek. In 1955 an independent Department of Engineering Technology was formed from this Department with the same head of department. In 1967, part of Department of Engineering Technology and Ing. V. Sekanina became its first head.

In 1969, two institutes were formed within the Department: Institute of forming (headed by senior lecturer Ing. Zdeněk Petržela, CSc.) and Institute of Welding (headed by prof. Ing. Jan Kučera, CSc.). In 1970 prof. Ing. Jaroslav Veselý, CSc. became the Head of the Department, and in 1979 he was replaced in this position by prof. Ing. Horymír Srp. At the same time the department expanded by formation of another two institutes: Institute of designing (headed by doc. Ing. Jiří Smetana, CSc.), and the Institute of engineering materials and surface treatment (headed by prof. Ing. Miroslav Mohyla, DrSc.). During the period 1982 - 1992 the department was headed by prof. Ing. Miroslav Mohyla, DrSc., in 1992 by prof. Ing. Jaroslav Koukal, CSc., in the period 1993 - 2002 by senior lecturer Ing. Richard Březina, CSc., in the period 2002 - 2013 by prof. Ing. Jiří Hrubý, CSc., and since 2013 it is headed by Ing. Petr Mohyla, Ph.D.

Department of Mechanical Technology is part of the Faculty of Mechanical Engineering, VŠB-Technical University of Ostrava. According to the focus of scientific research and teaching activities the department is organisationally divided into four institutes:

- Institute of forming- headed by prof. Ing. J.Hrubý, CSc.;
- Institute of welding headed by doc. Ing. D.Schwarz, CSc.;
- Institute of material and surface treatment headed by doc. Ing. J. Podjuklová, CSc.;
- Institute of designing, organisation and economics of engineering production headed by doc. Ing. J. Novák, CSc

Profile of laboratories at the Department of mechanical technology:

Laboratory of mechanical testing



Laboratory of technology innovation was established in order to strengthen scientificresearch and development capacity of the Department of mechanical technology, Faculty of Mechanical Engineering, and it represents specific close cooperation between the department and the divisions "New materials and technologies for their production" and "Nanotechnology" at the CPIT. The laboratory is used for solution of scientific and research projects in the areas of development of technologies of thermal-mechanical processing, designing and preparation of laboratory experimental equipment and mechanical testing of materials.

The laboratory is at present involved in an important way at solution of grant, research and commercial projects. The laboratory can provide to other research centres of the VŠB - Technical University of Ostrava a diverse spectre of services. This research working site provides also experimental support of teaching the subjects of the Department of Mechanical Technology, Faculty of Mechanical Engineering.

Laboratory of welding

Laboratory of welding of the Department of mechanical technology is equipped, thanks to the cooperation with the Czech Institute of Welding Ltd., with equipment at European level for arc welding: with use of coated electrode, non-consumable tungsten electrode in a protective atmosphere of inert gases, melting electrode in protective atmosphere of inert and active gases, automatic welding with use of soldering flux. The laboratory collaborates with the divisions of New materials and technologies for their production and Nanotechnology at the CPIT.

Laboratory of monitoring of welding technologies

The laboratory deals with the issues related to monitoring of fusion and pressure welding technologies, determining of unconventional properties of materials for numerical simulation of welding and heat treatment, determination of technological data for numerical simulation of welding, use of magneto-elastic method for evaluation of selected properties of ferromagnetic materials (in particular of the spatial distribution of residual stresses). It deals also with surface hardness, degradation of materials after long-term exposure, surface integrity after application of production technologies, non-destructive methods for evaluation of materials and methods of mathematical modelling and simulation of welding technology and heat treatment, including numerical simulation.

Laboratory of material properties



The laboratory is designated for measurement of all mechanical properties of materials and determination of their metallographic structures. The laboratory is used for teaching of all technological subjects of the department. The laboratory is a research working site for all scientific and research projects of the department with a wide spectrum of the offered external services.

Laboratory of elektrochemistry and elektric forming

Laboratory deals, among others, with development of electroplating baths based on metals of the iron group with focus on their chemical and current parameters in relation to mechanical properties of deposited coatings or layers. The development is focused not on the protective coatings against corrosion, the deposition technologies of which are well known, but on the functional coatings with appropriate technological and tribological properties for use in engineering. The research is further oriented on explanation of the process chemistry in order to deposit thick layers of nickel based materials with low, or even zero internal stress for use at electric forming. Within the frame of the CPIT the research is further focused mainly on the FeNi alloy coatings for renovation of engineering components and for enhancement of their functionality and service life, and also on solution of renovation of functional surfaces of the moulds for continuous casting with use of wear resistant coatings based on Ni-Co-P. By solution of the GAČR grant projects this working site has engaged among the first ones in research of possibilities of deposition of composite coatings with Ni matrix with embedded carbide particles and metal oxides with dimensions of µm or nm in order to increase the resistance of the surface to adhesive and abrasive wear, including enhancement of its mechanical properties.

Laboratory of designing of material surface

The laboratory deals, among others, with material - technological aspects of formation of advanced protective coating systems for use in demanding corrosive environments, as well as with solution of cracking and formation of defects in vitreous enamel coatings - investigation of the phase interface and brittle fracture properties of vitreous enamel coatings and solution of suitability of use of new types of steel / continuously cast steel, IF steel / especially for application of vitreous enamel coatings, as well as development of methodology for assessment of the quality of organic coatings applied on various matrices and solution of surface treatment of matrices before application of protective coating systems. The laboratory cooperates with the divisions of New materials and technologies for their production and Nanotechnology at the CPIT.



Laboratory of integrated control

Laboratory deals with development of a universal database, that would be usable particularly for the control of maintenance or for assemblies and other auxiliary and service processes. The laboratory has been created with a support of the MIT grant "KONSORCIA". In collaboration with other co-investigators it verifies the possibility of implementation of the database together with other software for control and thus develops methodologically and by specific outputs a tool enabling practical implementation of TIM (totally integrated maintenance) into the current maintenance practices. The developed database is a set of information that can be advantageously used for quality control.

Laboratory of modelling of technological processes

Laboratory of modelling as yet does not exist at the Department of mechanical technology. Until now the computers and related software for simulation of technological processes are situated in the computer teaching room D303 and at working sites of teachers, where they are used in accordance with specific orientations for teaching and research performed within the running projects. Highly sophisticated devices for obtaining material and technological data are appropriate addition to this. In particular, although the software is used conceptually, it is, however, individually and in different time resolution. The existing computer systems have high demands to hardware, its operation and exploitation. Individual use of PCs by teachers in case of simultaneously running calculations lasting several hours, blocks other works. Concentration of computer equipment and software in one laboratory would allow its more efficient use and setting and perhaps also more advantageous licensing policies. The inspiration may be taken from the system "MSC.MasterKey" of the company MSC.Software, the products of which could cover most of the needs of the proposed laboratory of modelling of technological processes. The advantage of such an arrangement may be extended also to the sister Department of machining and assembly, which would be best conceived as a laboratory serving the whole faculty.

2.1.1 Presentation of person involved in the project "Nanoteam VSB – TU Ostrava"

At the Department of mechanical technology, VŠB - Technical University of Ostrava during the period 2006 - 2013 a team of teachers, researchers concerned with the development of technology and processes for production of ultra-fine-grained and nano metals, was created. Within the project of MIT (Ministry of Industry and Trade) No. 2A-1TP1/124 entitled "Research of the impact of extreme conditions of deformation on sub-microstructure of metals and testing methods for the diagnostics of their technological properties", and the project GA ČR (Grant Agency of the Czech Republic) No. 101 / 08/1110



entitled "Development of a new technology using a high degree of deformation for production of ultra-fine-grained materials", an experimental working site was developed dealing with the above issues. Large part of the employees of the Department of mechanical technology was incorporated into this scientific and research team.

prof. Ing. Stanislav Rusz, CSc.

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Professional and scientific and research activities of prof. Ing. Stanislav Rusz, CSc. is focused particularly on basic research in the area of development of new types of metal forming technologies for manufacture of highly fine-grained materials, as well as on the development of new types of forming tools in the given field and investigation of non-conventional forming technologies (superplasticity, orbital forming, forming of powder materials). At the Department of mechanical technology and in the Institute of forming he specialises on the use of non-conventional forming technologies for preparation of ultra-fine-grained materials in areal and bulk semis using SPD (severe plastic deformation). It concerns specifically the alloys of non-ferrous metals based on aluminium and magnesium in case of the ECAP technology, and non-ferrous metals, such as copper, brass and medium carbon steels in case of the DRECE method.

Teaching activitues:

New findings from the field of development of technologies for production of UFG and nano metallic materials have been introduced to the following subjects: Technology of casting, forming and welding, forming, Technology I, Forming of metals and non-conventional methods in Forming, Technology for preparation of bulk nano-materials, and also in the subjects of the PhD degree study program - Theory and technology of forming and Formability of metals.

Selected solid projects:

MPO 2A-1TP1/124, název: "Výzkum vlivu extrémních podmínek deformace na submikrostrukturu kovů a zkušebních metod pro diagnostiku jejich technologických vlastností"

GAČR 101/08/1110 název: "Vývoj nové technologie využívající vysoký stupeň deformace pro výrobu ultra-jemnozrnných materiálů"



MŠMT "KONTAKT" ČR - Polsko název: "Al and Cu alloys production by several plastic deformation with aim to obtain high grain refinement"

MŠMT "KONTAKT" ČR – Slovensko MEB 0810022 název: "Nové směry ve zvyšování efektivity vícenásobné plastické deformace"

OP VK CZ.1.07/2.3.00/20.0038 s názvem "Tvorba mezinárodního vědeckého týmu a zapojování do vědeckých sítí v oblasti nanotechnologií a nekonvenčního tváření materiálu"

prof. Ing. Jiří Hrubý, CSc.

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Professional activities of prof. Ing. Jiří Hrubý, CSc. are primarily focused on physical and numerical modelling of forming processes, on evaluation of formability of metallic materials, powders and composites at bulk and planar forming, and on creation of dynamic material models and models of polar reciprocity. His scientific and research activities deal with the development of methods for testing the service life of designs of forming tools and jigs and with the influence of magnetic and electric fields on the thermo-mechanical properties of materials.

Teaching activities:

Guaranteed discipline: PhD. Degree study programs – P2346 Mechanical engineering – 2303V002 Engineering technology

Guaranteed subjects: Theory of forming, formability of metals and unconventional forming methods, experimental and computing methods for forming

Solved projects:

1995–1996	GAČR 101/95/1183 – Limity tvařitelnosti při plošném a objemovém tváření vícevrstvých materiálů.
1996–1997	GAČR 101/96/0506 – Simulace procesů tváření za tepla užitím MKP.
1999–2001	GAČR 101/99/0118 – Analýza procesů objemového tváření z hlediska stability, reprodukovatelnosti a homogenity výrobků.

2000–2004 MŠMT LN00B029 – Materiálově technologické výzkumné centrum.



INVESTMENTS IN EDUCATION DEVELOPMENT 2003–2004 MŠMT LZ1K03014 – Ověření dynamického materiálového modelu pro průmyslové aplikace

doc. Ing. Jitka Podjuklová, CSc.

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Head of the department of engineering materials and surface treatment. Professional specialisation of doc. Ing. Jitka Podjuklové, CSc. is in the area of engineering materials and surface treatment, an especially in the area of vitreous enamel coatings and thin films containing nano-elements. Her scientific and research are focused on engineering materials and surface treatment, in particular on research and development of thin coatings with nano-elements for short-term and long-term corrosion protection of metallurgical products, as well as research and development in the field of vitreous enamel coatings with nanoelements, particularly for use in consumer goods, architecture, agriculture, power engineering and medical science. Her research and development activities concern also the field of galvanic coatings for renovation of products, coating of products and coatings containing nano-elements.

Teaching activities:

The institute provides teaching of in the subjects Structural materials, Surface treatment, Technology of surface engineering, Surface treatment and restoration I. and II., Unconventional engineering materials and heat treatment, Nano-technology in coating of engineering materials, Theory of technological processes.

Within the above mentioned teaching of subjects she cooperates with the faculties of the university, namely with the Faculty of Metallurgy and Materials Engineering (FMME), where she teaches in the courses in Surface treatment and restoration, and with the Centre of nano-technologies, where she teaches the subject Nano-technologies for application of coatings on engineering materials.

Within the framework of international cooperation in the Erasmus programs she teaches foreign students in English, namely the subjects Theory of technological processes, Technology of surface engineering, Surface treatment. She is also involved in co-operation with the association IAESTE Czech Republic organising for students from abroad short term interships in laboratories so that they can gain research experience. In the PhD. Study programs she is involved in supervision of students from abroad, currently of 2 students from Poland.



Solved projects:

In the field of nano-materials and nano-technologies in the period 2008 - 2012 the international project KONTAKT ME08083 "Complex system of short-term and long-term corrosion protection of materials from metallurgical production" was solved in cooperation with the Russian Federation. Coordinator and responsible investigator of this project was doc. Ing. Jitka Podjuklová, CSc. prof. h. c. A protective transparent transport system was developed containing nano-element for a short-term corrosion protection of steel products, especially pipes, which are transported to oil fields, the application of which was tested in industrial conditions. On the basis of the results patent application PV 2012-893 was submitted in November 2012, entitled "Method of application of transparent water soluble paint for metallurgical product" and on 6th November 2013 the patent number 304 190 was awarded on the basis of this application. Other applications are in the field of research of vitreous enamel coatings containing nano-elements.

prof. Ing. Radek Čada, CSc.

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Professional and scientific and research activities of prof. Ing. Radek Čada, CsS. focus on the field of "Engineering Technology" and engineering forming, especially on the issue of sheet metal forming. He deals mainly with evaluation of the formability of metallic sheets, method of deformation meshes for analysis of deformations and stresses in extracts from metallic sheets, drawing of extracts of irregular shapes and simulation of drawing of metallic sheets. The work deals with the acquisition of new knowledge about material and technological formability of numerous sheets, taking into account the effect of anisotropy of their mechanical properties, comparison of different methods for determination of nonconventional criteria of formability of sheets and verifications performed with use of the software Dynaform 5.2 for verification of agreement of deformations.

Teaching activities:

Teaching of subjects in bachelor, master and PhD. Study programs in the field "Engineering technology", e.g.: "Special technology – forming", "Forming technology", "Formability of materials and unconventional forming methods", "Computing methods for forming", "Engineering forming ", "Technology", "Technological aspects of designing", "Special technologies and repairs", "Introduction to forming", "Principles of engineering technology", "Technology I", "Special technologies and repairs", "Manufacturing technologies", "Maintenance procedures I", "Formability of materials", "Technologies of



forming and casting", "Engineering technologies I", " Technologies of forming, casting and welding".

He is member of the committee for comprehensive examinations at the Faculty of Mechanical Engineering, VŠB-TUO, member of committees for bachelor and master degree final examination in the discipline 23-07-8 "Engineering technology" and in the discipline 23-07-10 "Technological management", member of the professional counsel for the PhD. Study program P2341 "Mechanical engineering" in the discipline 2303V002-00 "Engineering technologies",

Solved projects:

1994 ÷ 1995 – spoluřešitel grantového projektu GA ČR reg. č. 101/93/0133 o názvu "Optimalizace teplotních podmínek a deformačních rychlostí při tváření vybraných druhů ocelí z hlediska dosažení maximálních deformací"

1995 ÷ 1997 – spoluřešitel grantového projektu Grantové agentury České republiky reg. č. 101/95/1172 o názvu "Optimalizace procesu kování slinutých vysokouhlíkových ocelí za podmínek superplastického stavu"

1999 ÷ 2004 – řešitel dílčího úkolu výzkumného záměru CEZ J17/98:272300010, později označovaného MSM272300010 o názvu "Výzkum, vývoj a inovace technologií tváření, svařování, povrchových úprav, ekonomiky a managementu a obrábění"

2002 ÷ 2004 – spoluřešitel grantového projektu Grantové agentury České republiky reg. č. 106/02/0412/A o názvu "Vliv povrchových vad na tvářitelnost a užitné vlastnosti drátu z mikrolegované oceli určeného pro výrobu vysokopevných spojovacích součástí"

2013 ÷ 2014 – spoluřešitel projektu Evropského sociálního fondu MŠMT, operačního programu "Výzkum a vývoj pro inovace" reg. č. CZ.1.05/3.1.00/10.0218 o názvu "Rozvoj a stabilizace systému transferu technologií VŠB-TUO"

Ing. Vladislav Ochodek

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Professional and scientific and research activities of Ing. Vladislav Ochodka focus on the theory and technology of joining (welding, soldering, gluing). The main research activity is evaluation of the weldability of structural materials, steel, non-ferrous metals, plastic materials, and evaluation of selected properties of SPD and UFG materials with focus on the



residual stress. It includes also the development of new technologies of non-destructive evaluation of ferromagnetic materials using the magneto-elastic principle with subsequent analysis of the degradation of ferromagnetic materials by magneto-elastic method as a result of the effect of individual production technologies and exploitation cycles. Another area of research is the evaluation of the service life of welded joints in the power engineering and petrochemical industry and of selected parameters of surface integrity after the final operations, such as machining, grinding, lapping, heat treatment, thermal spraying. The last area of professional activities of Ing. Ochodka is the monitoring of technology of welding and heat treatment, preparation of technological data for numerical simulation. Advanced numerical simulation of welding and heat treatment, including stress and structural changes and experimental verification of the results.

Teaching activities:

Teaching of subjects in Czech:

345-0305 – Welding; 345-0352 – Technologies of forming, casting and welding; 345-0348 – Introduction to welding; 345-0350 – Principles of welding technologies; 345-0318 – Computer Aided Welding

Teaching of subjects in English:

345-0350 - Welding Fundamentals; 345- 0318 - Computer Aided Welding

Solved projects:

- 2011 2013 Helpdesk-svařování. VŠB TUO, HS 345 302. Zadavatel Česká rafinérská a.s., Tediko s.r.o.
- 2012 Analýza zbytkových napětí manipulačního pístu. VŠB TUO, HS 345 204, Zadavatel: Vítkovice Heavy Machinery a.s.
- 2013 Analýza zbytkových napětí na opracované hřídeli Warstila.VŠB TUO, HS 345 304 Zadavatel: Vítkovice Heavy Machinery a.s.
- 2013 Analýza zbytkových napětí magnetoelastickou metodou u vzorků 15"závěrných kruhů. VŠB TUO, HS 345 303 Zadavatel: Hayes Lemmerz Czech s.r.o.
- 2013 Analýza zbytkových napětí magnetoelastickou metodou na materiálu 10GN2MFA a SA-336 F22V.VŠB TUO, HS 345 306 Zadavatel: Mecas ESI s.r.o.



2011 – 2014 Tvorba mezinárodního vědeckého týmu a zapojování do vědeckých sítí v oblasti nanotechnologií a nekonvenčního tváření materiálů. CZ.1.07/2.3.00/20.0038

doc. RNDr. Lubomír Čížek, CSc.

lubomír.cizek@vsb.cz

Professional and scientific and research activities of doc. Ing. Lubomír Čížek, CSc. are focused on basic research in the field of structure of classical and special materials, their performance, mechanisms of material degradation and possibilities of influencing properties of technical materials, e.g. by heat treatment. Part of the research activities is also a considerable interest in the investigation of materials, which are exposed to severe plastic deformation, especially to technologies for production of ultra-fine-grained materials (UFG) and nano-materials.

Řešené projekty:

- 1994 1996 Chairman of the Pedagogic Council of the FMMI, VŠB-TU Ostrava
- 1997 2004 Coordinator of the project "CEEPUS CZ-13"
- 2000 2005 Member of the project "CEEPUS PL-13
- 2001 2004 Coordinator of the project "GAČR 106/01/1247"
- 2005 2007 Coordinator of the project "INTERREG IIIa"
- 2006 2009 Member of the project MPO No. 2A-1TP1/124
- 2008 2011 Member of the project MSMT 6198910015
- 2008 2010 Member of the project GACR No. 101/08/1110
- 2011-2014 Member of project Ministry of Education, Youth and Sports (MEYS), No. CZ.1.07/2.3.00/20.0038



2.2 COMTES FHT a.s., Dobřany

COMTES FHT a.s., Průmyslová 995, Dobřany 334 41, T: +420 377 197 311, F: +420 377 197 310, E: comtes@comtesfht.cz, http://www.comtesfht.cz

2.2.1 Presentation of the working site in the research organization COMTES FHT a.s

The private non-profit research organization COMTES FHT as (hereinafter COMTES) was founded in the year 2000. Its mission from the very beginning was oriented on promotion of Czech manufacturers in the area of development, innovation and at implementation of cutting-edge technologies and products.

The company COMTES started as an ordinary engineering office with only six employees and computers. Already shortly after its founding it appeared that manufacturing companies would not settle for a partial solution of individual highly specialised areas of production, but that they needed comprehensive material and technology solutions, which required teamwork of experts in many professions. Original engineering company therefore first expanded the volume and areas of external cooperation. However, gradual expansion of the company and building its own testing laboratories and new departments appeared to be more efficient and flexible.



Area sof activities and services provided by the COMTES FHT during the first years of existences by own forces.

The company gradually expanded from year to year and changed to a full-scale research organization. The company's activity are hidden already in its title – **COM**plete **TE**chnological **S**ervice for Forging and Heat Treatment.



Provision of highly professional services in research and development was the main intention already from the start-up of the company. The first residence was in the rented offices in Borská street in Pilsen, where laboratories of numerical simulation and light microscopy were gradually created.



The first residence of the company in Borská street

In 2003 a subsidiary company COMTES DFM Ltd. Was established together with an Austrian partner, which owns the license for selling and distribution of the software DEFORM in the Czech and Slovak Republic. The year 2004 represents the first major milestone in the company history. Since the start of that year began the solution of the project supported by the Ministry of Education, Youth and Sports of Czech Republic. This solution required additional staffing, extension of offices and laboratories. In mid-2004 we therefore purchased our own premises in Lobezská street in Pilsen. In the new complex the laboratories of forming, heat treatment, electron microscopy were gradually built, as well as fitter's workshop for production of samples.



Premises in Lobezská street

In 2005, the quality management system according to the ISO 9001 was implemented. In 2006 the accredited Material testing laboratory was established according to the ISO 17025. At the same time in 2006 a mechanical testing laboratory was established in the premises rented in Dolní Vlkýš near Pilsen. In 2007 a unique prototype of simulator of



thermo-mechanical cycles was commissioned, which was temporarily situated at the University of West Bohemia in Pilsen. Already at the end of 2006 it was clear that capacities of the existing research facilities were insufficient and that it was necessary to concentrate the company into one location. In mid-2007 the company COMTES with help of the project within the program OPPI POTENCIÁL bought a new building in Dobřany, Plzeň-jih, which was put into operation in January 2008.



Research facilities of the company COMTES FHT a.s. in Dobřany in 2008

In 2008 the company completed its development by transformation into the jointstock company and research organisation under the rules of the EU Community Framework. (The company COMTES followed, however, the rules for non-profit research organisations since its very beginning).

After ten years it was possible to speak of a high-tech research organisation with almost 50 employees (including 32 researchers with university education).

Another important milestone of the company came in 2011, when at the end of the year the Minister of Education signed an agreement on solution of the investment project "West Bohemia material and metallurgical centre (ZMMC), which is addressed within the program of the Structural Funds "Research and Development for Innovation", within the sub-program Regional research centres. This project will be completed in 2014 and will allow significant expansion of the research capacity of the company COMTES FHT.

For the possibility of further development of the company land was bought in 2012 near the existing premises (at a distance of approx. 100 m), where the future construction of an office building with accommodation for trainees is planned, as well as of another building with a lecture hall, training centre and space for the company nursery. Currently the selection procedure for the supplier is running.



At present the premises in Dobřany enable intensive development of the company and expanding of the COMTES portfolio of activities. Advantage of the company COMTES is in the fact that it was built from the bottom, on a green field and using its own funds. Its structure reflects the current needs of the customers, the company has no liabilities from the past. Competitive organisations were created either by privatisation of research companies, or as a part of some universities. Major competitive advantage consists in the provision of comprehensive services and rapid response to new customer requirements, both from the perspective of technical equipment and instrumentation, and in terms of personnel.

After more than twelve years of operation this research organisation has technical and human resources for research and development services in the following areas: computer modelling, metallurgical technologies, material analyses, mechanical testing and thermo-physical measurements.

In the field of ultra-fine-grained materials the tests are carried out in the laboratory conditions aimed at achieving ultra-fine-grained structures in metallic materials with use of severe plastic deformation (e.g. procedures of ECAP, CGP, etc.). These procedures have recently been further developed in the pilot plant conditions on the equipment CONFORM, which makes it possible to prepare longer rod blanks made of materials with ultra-fine-grained structure.

Developments in microstructure refining are focused on severe plastic deformation.

The equipment CONFORM serving for application of severe plastic deformation on wire and sections, and ECAP device for application of severe plastic deformation on short blanks are used for technological development.

2.2.2 Presentation of person involved in the project "Nanoteam VSB – TU Ostrava"

Ing. Michal Zemko, Ph.D.

mzemko@comtesfht.cz

Ing. Michal Zemko, Ph.D. is within the topic of nano-materials specifically oriented on preparation of materials suitable for medical applications. He has successfully addressed this topic in the context of the project supported by the Ministry of Industry and Trade FR-TI1/415 - Research and development of nano-structured materials for medical purposes (2009-2012, MPO / FR).



Another members of the research team of the above project were Ing. Josef Hodek, Ph.D. and Ing. Tomáš Kubina, Ph.D.

prof. Ing. Jozef Zrník, CSc.

jzrnik@comtesfht.cz

Prof. Ing. J. Zrník is a world-renowned expert in the field of SPD. He studies relationships between the basic properties of nickel super-alloy structures (including neutron diffraction in analyses of structures) and their behaviour under stress conditions, as well as high strength of low alloyed steel structures. His latest research plan deals chemical-mechanical processes in the production of ultra-pure steel and nano structured materials.

He was and is member of research teams in many R & D projects. The most important project, in which prof. Zrník was the main investigator, was the project MSM2631691901 Metallic materials with the structure in sub-micron and nano metric scales prepared by the methods of severe plastic deformation.

Within the project ED2.1.00/03.0077 – of the West Bohemia material metallurgical centre (2011-2014, MSM / ED) he leads the research program VP 2 Metallic materials for special applications.

Ing. Libor Kraus

libor.kraus@comtesfht.cz

Ing. Kraus is the chairman of the research organization COMTES FHT a.s. Within the research and development in the field of materials research he participated as researcher or member of the research team in solution of more than 10 scientific projects.

Dr. Ing. Zbyšek Nový

znovy@comtesfht.cz

At present he holds position of the Vice Chairman of the Board of Directors of the company COMTES FHT a.s. In the area of science and research acts as Research Director of the West Bohemia material metallurgical centre, coordinates the research and is responsible for solution of research programs VP1 and VP2.

In addition to this project he was the investigator or co-investigator in more than 10 research projects supported by the Ministry of Education, Youth and Sports, MIT and GA.



doc. Ing. Ján Džugan, Ph.D.

jdzugan@comtesfht.cz

Director of Research and Development is investigator or co-investigator in several R & D projects of MIT and TA ČR. In the project of the West Bohemia material metallurgical centre he leads the research program VP 1 Thermo-mechanical processing of advanced steels.

2.2.3 Professional orientation of the working site the company COMTES FHT a. s.

In the field of ultra-fine-grained materials tests are carried out in the laboratory conditions aimed at achieving ultra-fine-grained structures in metallic materials using severe plastic deformation (e.g. procedures of ECAP, CGP, etc.). These processes have recently been further developed in the pilot plant conditions on the equipment CONFORM, which makes it possible to prepare long rod blanks of materials with ultra-fine structure. Development in the area of refining of microstructure is focused on severe plastic deformation.

The equipment CONFORM serving for application of severe plastic deformation on wire and sections, and ECAP device for application of severe plastic deformation on short blanks are used for technological development.

Teaching activities

Prof. Ing. Jozef Zrník, CSc. transferred his knowledge and experience gained in the relevant filed to the students of the Metallurgical faculty at the Technical University in Košice, Slovakia, and beginning from 2003 also at the Faculty of mechanical engineering of the University of West Bohemia In Pilsen.

Other persons involved in the project also taught, namely Doc. Ing. Jan Džugan, Dr. Ing. Zbyšek Nový, Ing. Michal Zemko, PhD., mostly at the Faculty of mechanical engineering of the University of West Bohemia In Pilsen.

2.2.4 Orientation and solution of th projects solved in the company COMTES FHT a.s.

The company COMTES FHT a.s. as research organisation solved and solves more than 50 research national and international projects as the main receiver or another participant. We present below important projects solved by the research organisation in the field of ultra-fine grained materials and nano-materials:

MSM2631691901 - Metallic materials with structure in sub-micron and nano-metric area prepared by methods of severe plastic deformation (2004-2010, MSM)





Project abstract: The research plan was focused on creation of ultra-fine submicroscopic and nano-structured materials by the application of severe plastic deformation simultaneously with controlled thermal exposure on selected materials. Steel and aluminium alloys were primarily selected for the experimental program. Within the project several types of deformation techniques were applied, accompanied by various temperature modes. Processed materials were analysed in detail from the viewpoint of their microstructure and properties. The most important objective of the research plan was theoretical understanding of mechanisms of grain refinement to the nano-structured form, determination of physical limitations in terms of grain refining and structure stability and achievement of mechanical properties of materials.

Altogether 67 results were obtained, which are recorded in the database RIV.

GAP107/10/2272 - Zrychlená sferoidizace karbidů a zjemnění zrna ocelí (2010-2012, GA0/GA)

GAP107/10/2272 – Accelerated spheroidisation of carbides and grain refinement in steels (2010-2012, GA0/GA)

Project abstract: The project dealt with processing of steel in order to achieve the microstructure with spheroidised carbides precipitated in ferritic fine-grained matrix. This microstructure was prepared by a rapid ASR process (Accelerated Spheroidisation and Refinement), which can make a part of a thermo-mechanical or thermal processing. Microstructure and mechanical properties and particularly dynamic properties of steels for selected application of the ASR process may achieve extraordinary parameters. It was therefore research of the process, which brings both important potential for energy and time savings in steel processing, as well as a completely new quality of steel materials. Within the project the principle of the transformation mechanism and kinetics of the ASR process were investigated. The influence of the ASR parameters on evolution of the microstructure in steels and of their mechanical properties was described. The investigation concerned moreover the influence of the chemical composition and initial microstructure on evolution of the process.

New findings were obtained - understanding of the mechanism of the ASR process (Accelerated Spheroidisation and Refinement). Impacts of individual process parameters on the microstructure and on the final mechanical properties of various types of steels were described. The results were summarised in articles published in 6 peer-reviewed journals (in 1 impacted journal), in 7 Conference Proceedings referred in WoS, and in 3 patents (1 foreign patent).





Several outputs were achieved, see the examples below:

RIV/26316919:____/12:#0000336 - AcceleratedCarbideSpheroidisation in 100CrMn6 Bearing Steel (2012)

RIV/26316919:____/12:#0000334 - Acceleratedcarbidespheroidisation(ASR) in lowalloyedsteels (2012)

RIV/26316919:____/12:#0000337 - Modification of microstructure of 100CrMn6 steel by acceleratedcarbidespheroidisationprocess (2012)

RIV/26316919:____/12:#0000335 - New process for acceleratedcarbidespheroidisation of RSt 37-2 steel (2012)

RIV/26316919:____/11:#0000275

VerarbeitungsweiseeinesStahlhalbzeugesüberdie Ac1-Temperatur (2011)

FR-TI1/415 - * Research and development of nanostructured materials for medical purposes (2009-2012, MPO/FR)

Project abstract: Project addressed the research and development of medical implants made from nano-structured titanium materials. Consortium of solving organisations consisted of two small companies and university working site. The research organisation COMTES FHT a.s. was the coordinator and the end user of project results for production of nano-structured semis. End user of results concerning the production of implants was in the consortium represented by a small company, which was engaged in the development, manufacture and distribution of dental implants, surgical instruments and accessories. Basic university research was represented by the Medical Faculty in Pilsen representing the Charles University in Prague. Project addressed comprehensively the production of nano-structured semi-finished products and medical implants, including their biological testing. Problems in all areas were solved by application of our top experts and university working sites.

Altogether 8 outputs solutions were achieved within the project (certified methodologies (industrial) utility models, implementation of technology, publications), examples of which are listed below.

RIV/26316919:____/13:#0000386 - Tvářecí ústrojí pro kontinuální výrobu jemnozrnných polotovarů z vysoce pevných kovů (2013)



RIV/26316919:____/12:#0000341 - Technologie tváření titanových tyčí na zařízení Conform S315i bez změny rozměru s dosažením nanostruktury (2012)

RIV/26316919:_____/12:#0000320 - Vývoj technologie zpracování titanových drátů s ultrajemnou strukturou pomocí zařízení CONFORM (2012)

RIV/61989100:27230/09:00020405 - Nanostrukturní titan v dentální implantologii (2009)



2.3 University of Münster, Germany

University of Münster, Institut fürMaterialphysik, Wilhelm-Klemm-STr. 10, 48149 Münster, T: +49 251 83-33571, F: +49 251 83-38346, matphysik@uni-muenster.de, http://www.uni-muenster.de/Physik.MP/

Prof. Dr. Gerhard Wilde

gwilde@uni-muenster.de

Our research interest is focused on the basic properties of interfaces and their interaction with other lattice defects leading to complex defect reactions that have a large impact on materials properties and performance. In our laboratory, materials are synthesized by different methods and the main characterization methods are based on scanning and transmission electron microscopy, calorimetry and thermal analysis, mechanical testing and indentation, low-temperature transport and optical properties and radiotracer diffusion. The combination of a large range of complementing characterization tools allows for an in-depth analysis of microstructure-property relationships.

Research topics and equipments

The IMP (Institute of Materials Physics of University of Münster) is an integral part of the "Nanoscience" focus area of the department of physics. The institute is composed of two professorships (one with and the other without leadership function). Including permanent and non-permanent researchers and staff, about 85 people work at the IMP.

The research at the institute is primarily focused on basic materials physics issues involving the relationship between the microstructure including the atomic level structure and the resulting mesoscopic and macroscopic properties of a wide spectrum of materials. The materials classes studied include metallic glasses, nanocrystalline and ultrafine grained metals and alloys, liquid metals, nanostructured surfaces, semiconductor heterostructures and polymer electrolytes. The institute es are focused on 4 mains transversal topics including energy, ecology, health science and advancencompasses several dedicated means for materials synthesis and processing, such as rapid melt quenching, single crystal and bicrystal growth facilities, r.f. induction melting, arc melting, rolling, high-pressure torsion and several deposition methods including PVD, CVD, ALD and electrodeposition. In addition to the conventional characterization techniques (XRD, DSC, DTA) the institute has high standard transmission electron microscopes (TEM-STEM) equipped with HAADF, EELS, EDX mapping,



and a new FE-SEM with EBSD/EDX, AFM and digital and analog optical microscopy. Metallurgical researches are also supported by a mechanical testing machine (Instron) equipped with a high temperature furnace, a nano-indenter with scratch test, TMA, several micro-tensile testing machines, a custom-designed micro-chip calorimeter, a high-sensitivity isothermal microcalorimeter, a device for measuring low-temperature heat capacity, transport properties and magnetic properties (PPMS) and a fully equipped radiotracer laboratory with the permission to store and handle solid and liquid radiotracers for diffusion measurements including many furnaces, detectors and special devices for parallel sectioning.

Currently the activities on UFG and nanocrystalline metals and alloys are focused on the analysis of so-called "non-equilibrium" grain boundaries in Cu, Ni, Ti and binary alloys after severe plastic deformation.

Prof. Gerhard Wilde is the director of the institute of Materials Physics and is heading the group on Materials Physics. Dr. Harald Rösner is a senior scientist at the institute and is responsible for the electron microscopy equipment. He has about 15 years of experience in high resolution and analytical transmission electron microscopy and is a specialist for defect analysis and for analyzing deformed microstructures. PD Dr. Sergiy Divinski is a senior scientist at the institute with about 15 years of scientific experience and is responsible for the diffusion laboratory. He is a specialist for grain boundary diffusion and for interface properties. Dr. Martin Peter lechner is working on his habilitation and he is in charge of the surface nanostructuring unit. He is a specialist for martensitic transformations and for cold rolling.

Our work on UFG metals is focused today on the analysis of the complex and intricate coupling between high dislocation densities, structure modification of interfaces and the modification of (mostly) mechanical properties. In addition, we now focus our attention on a directed modification of the internal interfaces to achieve a new type of "interface engineering" to obtain nanocrystalline materials with high thermal stability and enhanced mechanical performance.

Teaching activities

The expertise of the staff involved in the UFG activities is in the broader area of materials physics and physical metallurgy, including synthesis, processing, microstructure analysis and characterization. The staff involved in the UFG activities covers the entire area of materials science and materials physics on the Master level and additionally the area of experimental physics on the Bachelor level.



INVESTMENTS IN EDUCATION DEVELOPMENT Strategy and content of possible collaboration within the consortium

The field of metallurgy (chemistry, physics, mechanics and engineering) is the subject of intense discussions for development of projects in the domains of research and education since it appears as much necessary for industrial development in Europe. Our group is involved in these metallurgy initiatives and strengthen its activities on materials physics with melting, solidification, processing and mechanical properties of metals and alloys. UFG materials are among the materials of interest.

We are willing to keep connections in this framework in particular through organising joint scientific meetings, laboratory visits and welcoming visiting researchers. We also support collaborations with co-supervising PhD students within EU programs or industry financial supports.



2.4 Institute de Chimie et des Matériaux Paris-Est – CNRS-UPEC, France

Institut de Chimie et des Matériaux Paris-Est – CNRS-UPEC,2 rue Henri Dunant 94320 Thiais, Cedex France, http://wwew.icmpe.cnrs.fr/

Dr. Yannick Champion and Dr. Loïc Perrière

champion@icmpe.cnrs.fr andperriere@icmpe.cnrs.fr

ICMPE (Institut de chimie et des matériaux Paris-Est) is a joint laboratory CNRS and UPEC (University Paris East Créteil) composed of five research groups and six technical departments. About 100 permanents staff (CNRS and faculty members) and 50 non permanents (PhD, post doc invited researchers and trainees).

The researchers are focused on 4 mains transversal topics including energy, ecology, health science and advanced materials in the fields of metallurgy, solid state chemistry, polymer science and organic chemistry. The institute in the framework of its technical departments possesses high standard means for metallurgical processing in particular r.f. induction melting and various solidification techniques (melt spinning, levitation, suction casting), powder processing among which the spark plasma sintering (Dr Sinter. 515S Syntex). With usual characterization techniques (RX, DSC ...) the institute has high standard transmission electron microscopes (TEM-STEM) equipped with HAADF, EELS, EDX mapping, orientation mapping (ASTAR) and new SEM with EBSD. Metallurgical researches are also supported by mechanical testing machine (MTS 150 KN) equipped with a high temperature furnace and new nano-indentor (HYSITRON TI950 Triboindente) with scratch test, DMA and temperature (600°C) stage.

Currently the activities on UFG metals are focused on nano-copper powder sintering using the SPS technique.

Dr Loïc Pèrrière is a CNRS research Engineer and head of the department for metallurgical processing. The Spark plasma sintering is a platform of the Ile-de-France district and shared between different laboratories around Paris. The equiment is localised at ICMPE and Dr Judith Monnier (associate professor at UPEC) is the scientific responsible for the equipment. Dr Yannick Champion is CNRS research director.

L. Perrière and Y. Champion and member of the group MCMC (metals and ceramics with controlled microstructures) and J. Monnier is a member of the group CMTR (metallurgy of rare earth).



Teaching activities

Expertise of staff involved in the UFG activities is in particular chemical metallurgy including metal processing, structural characterisation and mechanical behaviour. Teachings then contain bases on thermodynamics (phase diagram, solidification,) transport properties, physical metallurgy for plasticity. Teaching at master degree level and school of engineer for industry is then focused on metal processing and powder techniques.

Strategy and content of possible collaboration within the consortium

The field of metallurgy (chemistry, physics, mechanics and engineering) is the subject of intense discussions for development of projects in the domains of research and education since it appears as much necessary for industrial development in Europe. Our group is involved in these metallurgy initiatives and strengthen its activities on chemical metallurgy with melting, solidification, processing and mechanical properties of complex alloys. UFG are among the materials of interest.

We are willing keeping connexions on this framework in particular organising joint scientific meetings, laboratory visits and welcoming visiting researchers (University has a visiting researcher program fundings). Collaborations can be organised in the framework of CNRS cooperative programs and we are looking for collaborations with co-supervising PhD students on EU programs or industry financial supports.



2.1 Institute of Metallurgy and Materials Science Polish Academy of Science

Institute of Metallurgy and Materials Science, Polish Academy of Science, 30-059 Kraków, 25 Reymonta St., Poland, T: +48 12 295 28 00, T: +48 12 295 28 01, F: +48 12 295 28 04, office@imim.pl, www.imim.pl

The Institute is one of the leading research centre in the field of fundamental and applied materials science. The research activities correspond to the priorities of Ministry of Science, Research and Information Technology, Polish Academy of Sciences and 6th Framework Programme of the European Community. The research is performed based a long-term co-operation with large number of scientific institutions in Poland and such countries as: Austria, Canada, France, Germany, South Africa, Hungary, Israel, Japan, Korea, Russia, Spain, Slovakia, USA, Japan, Holland, Slovenia, Ukraine, Taiwan and Korea. In recognition of its scientific achievements, the main Polish scientific authority-State Committee for Scientific Research systematically in every-four-year assessments, awards the Institute the highest possible grade.

Year	Publications in refereed journals (*Philadelphian List of ISI)	Conference presentations (posters)	Books	Organization of schools, workshops and conferences
2005	90(53*)	66(30**)	3	6
2006	122(71*)	61(28**)	6	6
2007	83(40*)	53(37**)	4	4
2008	95(57*)	75(55**)	3	7
2009	63(36*)	70(54**)	3	5
2010	132(72*)	65(26**)	4	8
2011	90(50*)	77(26**)	7	8
2012	110 (58*)	76(67**)	18	

Table 1. List of scientific publications and conference organized and presentations of the scientific employees of the Institute of Metallurgy and Materials Science PAS

The Institute employees 91 persons, including 41 scientific staff: 8 professors with tenure, 10 associate professors (with D.Sc.), 23 assistant professors (with Ph.D.). The Institute is authorized to confer Ph.D. and D.Sc. degrees in the field of metallurgy and materials engineering. The research on nanomaterials is performed mostly in the Laboratory of Functional Materials, where head of the laboratory is prof. dr. hab. ing. Jan Dutkiewicz.



Professional focus workplaces

At the Institute of Metallurgy and Materials Science of the Polish Academy of Sciences there are used many technologies and built apparatus for severe plastic deformation (SPD) like Equal Channel Angular Pressing ECAP, furthermore Accumulated Roll Bonding (ARB) High Pressure Torsion (HPT) however only for materials up to 0.5 mm thickness. Furthermore there are too high energy mills for planetary milling Fritsch Pulverisette 5 and specially constructed uni-axial press for hot pressing in vacuum used for uniaxial hot pressing materials with UFG structure, and nano-materials. There are now works going on compaction of ceramic-metallic powders. The Laboratory have also ability for production of UFG, nanocrystalline or amorphous melt spun ribbons from different alloy systems by use of advanced melt spinner. The other type vibratory mill available in Laboratory can be used for pulverisation of melt spun ribbons. This give chance to obtain the bulk UFG material applying the hot pressing of powders. The Laboratory has also possibilities for diagnostic especially microstructure of UFG materials by the electron microscopy techniques. The microstructure investigations can be performed from the micro down to atomic scale by use of High Resolution Electron Microscope Tecnai G2 available in Laboratory.

Prof. dr. hab. Inź. Jan Dutkiewicz

nmdutkie@imim-pan.krakow.pl

Research Associate at the Institute for Metal Research of the Polish Academy of Sciences in Kraków, from 1980 Associate Professor and from 1990 Professor at this Institute. Between 1993-1999 Research Director of the Institute. Work connected mostly with phase transformations in aluminium (Al-Zn, AlMgCu, AlZnMg, AlLi, AlCuSc) copper base and other nonferrous alloys. From 1983 worked on shape memory alloys. In 1985 appointed member of the Scientific Council of the International Center of Electron Microscopy at the Institute of Solid State Physics and Electron Microscopy In Halle East Germany, later at Max-Planck Institute of Microstructure Physics and currently at Humboldt University Berlin under direction of professor Neumann from Physics Departments. A member of the Organizing Committee of 6 European Schools on Electron Microscopy organized in Halle and Berlin. In years 1994-1998 appointed associate editor for Poland of Acta Materialia and Scripta Materialia. In 1996 granted European Project with Universities from Belgium, France, Spain and Ukraine in the Frame of INCO-COPERNICUS Porgramme on Nonconventional Production Technologies of High Temperature NiTi and Cu-base Shape Memory Alloys, From the year





2000 is responsible in the Institute for the European Project within the 5th Framework entitled "Bulk Metallic Glass Forming Alloys and Nanocrystallization, The project is continued in the direction of Metallic glass composites for the years 2004-2007 Properties and Application. Organizer of several conferences, among others Chairman of the of the International Conference on Light Alloys and Composites, in May 1999 with 120 participates, in the year 2000 of the Polish-Japanese Seminar on Materials Analysis with over 40 participants from Japan and Poland and in the year 2002 organized International Conference on Electron Microscopy with 140 participants. In years 1998-2000 was responsible for the Government Project on New materials and technologies in the Polish Aircraft Industry, which was completed with several industrial innovations. In June 2004 organized International Workshop "Thermoelastic and magnetoelastic intelligent materials" in the Frame of European Center of excellence NAMAM. In 2006 organized E-MRS Symposium on Phase Diagrams and Phase Stability theory and Thermodynamics 2006 in Warsaw and was cochairman of Polish-Japanese Symposium on Materials analysis in Toyama in September 2006. Elected v-ce chairman of er of Polish Microscopy Society. Since 1968 published 327 papers in scientific journals and conference proceedings, is author of 5 patents.

Teaching activities

Professor Jan Dutkiewicz has experience in teaching in the field of functio0onal materials which he was teaching at PhD studies at the Institute of Metallurgy and Materials Science of the Polish Academy of Sciences. He conducts also courses concerning materials science, diffraction methods light alloys, heat treatment and others the application of transmission electron microscopy in materials research. He was employed as professor at the Pedagogical University in Kraków where he was teaching materials science, thermodynamics and materials investigation techniques. He was also giving lectures in Ostrava in the frame of structural funds at mechanical Engineering department VSB, he was visiting professor at ETH Zurich., UIB Palma de Mallorca, Spain and Toyama University, Japan.

Participation in Research Projects:

In the last 5 years prof. Dutkiewicz participated in the following projects:

Charakterystyka kompozytów na osnowie aluminium umacnianych cząstkami kwazikrystalicznymi. 2011/03/B/ST8/05165 2012-2015 leader prof. .L. Lityńska – Dobrzyńska .ł. Wykonawca J. Dutkiewicz





Masywne amorficzne stopy aluminium uzyskane drogą konsolidacji proszków po mechanicznej syntezie, rozpylaniu z cieczy lub taśm po szybkim chłodzeniu. -2011/01/M/ST8/07828 Francja Leader J. Dutkiewicz

Innowacyjne materiały do zastosowań w energooszczędnych i proekologicznych urządzeniach elektrycznych. POIG.01.03.01-00-058/08 2009-2013 leader prof. W. Maziarz Finansowanie 996 363 .- zł. J. Dutkiewicz participant

Kompozyty i nanokompozyty ceramiczno-metalowe dla przemysłu lotniczego i Samochodowego, KomCerMet (2008-2012) POIG 01.03.01-14-013/08 - leader at IMIM PAN: doc Jerzy Morgiel; J. Dutkiewicz participant

Osłony balistyczne helikopterów i pojazdów specjalnych odporne na rażenie pociskami przeciwpancernymi kalibru 12,7 mm. (2009 – 2011 0R00000508 Leader:. J. Dutkiewicz

Opracowanie technologii wytwarzania, struktura i właściwości kompozytów na osnowie szkieł metalicznych z dodatkami metali i stopów nanokrystalicznych (2008 – 2011) N N 507348035, Leader: J. Dutkiewicz

Charakteryzacja stali w stanie stało-ciekłym przy pomocy zaawansowanego modelowania fizycznego i numerycznego. COST Akcja 541 (2007-2010) Leader at IMIM PAN J. Dutkiewicz.

Dr. hab. Inź. Wojciech Maziarz, Prof. PAN

w.maziarz@imimm.pl

The head of Laboratory of Spectral Chemical Analysis and expert in the Laboratory of Transmission Analytical Electron Microscopy Laboratory associated in frame of Accredited Testing Laboratories at IMMS PAS. In the Department of Functional and Structural Materials his main scientific interests are related to microstructure characterization using advanced transmission electron microscopy techniques, martensitic transformation in shape memory alloys, fabrication and characterization of amorphous and nanocrystalline materials obtained by powder metallurgy and rapid solidification methods. At the turn of 1997 and 1998 have been in the six-month internship at the Catholic University of Leuven (Belgium) in the project INCO-COPERNICUS, where worked on the analysis of high-temperature shape memory effect in Ni-Ti alloys obtained by powder metallurgy. In addition, as part of this project, he had one month an scientific internship in "Memry Europe" company, where analyzed the mechanical properties and application aspects of shape memory alloys. In the frame of The Fifth European Framework Programme between April and June 2001, he had a three-month internship at a post-doc



position at the Institut für Metallisch Werkstoffe in Dresden (Germany), where conducted research on the processes of amorphization and crystallization kinetics and grain growth in Al-Ni-Co alloys. In the years 2004-2012 participated in the organization of a number of scientific conferences, as a member of the Organizing Committee and secretary. He has been involved as a prime contractor in the execution of many research projects NSC, as well as international projects. In the years 2005-2010 I was head of the topics in the ordered research project "Smart materials, metallic, ceramic and polymer (design - production - structure - properties - application)", and the structural project of the Innovative Economy "Innovative materials for use in energy-saving and environmentally friendly electrical equipment", which is under construction by 2014. Currently run an international project under the NCN Harmony 3 with a partner from Spain, from the Department of Physics, University of the Balearic Islands. He is author or co-author of 88 publications including 55 papers in scientific journals cited by the ISI Web of Science h-index 7, one monograph and three chapters in books.

Teaching activities

Associate Professor Wojciech Maziarz has experience in teaching in the field of development of titanium based alloys at PhD studies at the Institute of Metallurgy and Materials Science of the Polish Academy of Sciences. He conducts also courses concerning the application of transmission electron microscopy in materials research.

The solved projects in IMMS PAS concerning nanocrystalline and UFG or shape memory materials and position held in projects:

PBZ-KBN-115/T08/2004 - New materials showing magnetic shape memory effect of the systems Co-Ni-Al and Fe-Ni-Al (2005-2008) – supervisor

MRTN-CT-2003-504692 - Ductilization of Bulk Metallic Glasses (BMG's) by Length-scale Control in BGM Composites and Applications (2004-2007)- contractor

HISZPANIA/122/2006 Preparation and characterization of new magnetic alloys showing shape memory (2007-2009) – main contractor

N N507 448534 - Production of nano and ultramicrocrystalline super high-strength Al-Mg-Zn-Cu-Zr-Sc alloys and characteristic of their structure by high resolution transmission electronmicroscopy methods, (2008-2010) - main contractor

N N 507348035 - Development of production technology, structure and properties of composites based on metallic glasses with additions of nanocrystalline metals and alloys, (2008-2011) - main contractor


POIG.01.03.01-14-013/08 - Ceramic and metal matrix composites and nano-composites for aviation and automotive industry - KomCerMet, co-ordinator: Institute of Fundamental Technological Research PAS (2008-2012) – contractor

POIG.01.03.01.-00-058/08- POIG.01.03.01.-00-058/08- Innovative materials for use in energy-efficient and environmentally friendly in electrical devices (2009-2013) – supervisor

Strategy and content of possible collaboration within the consortium

There are plans to exchange scientists to give lectures for students and within the Committee of Metallurgy Section of Physical metallurgy meeings for scientists of all Poland. There are also plans to invite with a lecture scientists from VSB Ostrava for a conference organized by IMIM PAN.

It is planned to use student exchange programs between universities – Erasmus network, Marie Curie, etc. It is possible to organise the short term visits for students concerning the training course on specific apparatus unavailable in other institutions.

From our side it can be suggested to cooperate on severe plastic deformation of light materials aluminium and magnesium alloys and light metal composites as well as fabrication and characterisation of UFG shape memory materials in the frame of the Nanoteam– VŠB-TU Ostrava.



2.2 University of Žilina, Slovakia

Žilinská univerzita v Žiline, Strojnícka fakulta, Katedra aplikovanej mechaniky, Univerzitná 1, 010 26 Žilina, Slovensko, T: +421 41 513 2951, F: +421 41 56 52 940, <u>kame.mms@fstroj.uniza.sk</u>, http://www.kame.uniza.sk/

doc. Ing. Tibor Donič, CSc.

tibor.donic@fstroj.uniza.sk

Výuková a výzkumná práce doc. Ing. Tibora Doniče, CSc. je zaměřena na zkoumání mechanických vlastností kovových materiálů, modelování zpevnění, studium únavových vlastností hořčíkových slitin a kompozitů, superplastickou deformaci, mechanické vlastnosti UFG materiálů a nano kovových materiálů a v neposlední řadě na dynamickou analýzu stavebních materiálů (dynamické tahové a tlakové zkoušky). Výzkumná činnost posledních letje pak primárně zaměřena na technologii ECAP s protitlakem, doplněná o možnosti využití ultrazvuku (4kW) při samotném procesu protlačování pravoúhlým kanálem.

V rámci svého dlouholetého působení na Žilinské univerzitě v Žilině je doc. Tibor Donič úzce spjat s mnoha vědeckými záměry mezi univerzitou a zahraničními spolupracovníky a výzkumnými centry (Německo, USA, Rakousko, Francie, Maďarsko, Rusko, Polsko). Od roku 2013 úspěšně spolupracuje, v rámci mezinárodního bilaterálního projektu, s Čínou. V současné době je také vedoucím mezinárodního projektu INCO Copernicus spolupracujícího s IFUM Hannover – Německo.

Strategie a obsah možné spolupráce po ukončení v rámci konsorcia:

Díky dlouholeté spolupráci s doc. Ing. Tiborem Doničem, CSc. je po ukončení projektu zajištěna možnost podílet se na přípravě a řešení projektů, především z oblasti nekonvenčního tvářní materiálů vedoucího k tvorbě ultra-jemnozrnných struktur a následného vyhodnocování dosažených výsledků, strukturních analýz, mechanických vlastností a dynamických zkoušek.



2.3 Czestochowa University of Technology

Czestochowa University of Technology, Centre for International Cooperation, ul. Dabrowskiego 69, room. nr 2, 42-201 Czestochowa, Poland

Czestochowa University of Technology (CUT) is the largest state university in the region. It is also the only one having full academic rights, i.e. it has the right to confer the title of doctor and university professor (habilitated doctor). During its sixty-year scientific and educational activities, it has become an inherent part of Poland's history and tradition, of Czestochowa region and the city itself. In nationwide rankings of the state institutions of higher education, we are among the top universities in Poland of a similar profile.

prof. PCz dr hab. inż. Marcin Knapinski and prof. dr. hab. inż. Henryk Dyja

knap@mim.pcz.czest.pl and dyja@mim.pcz.czest.pl

The Faculty of Production Engineering and Materials Technology and especially the Institute of Metal Forming and Safety Engineering of Czestochowa University of Technology belongs to the best public institutions in Poland dedicated to research in field of materials processing technologies, metallurgy and computer modelling.

Our laboratory o fis equipped with:

- Physical modelling and materials mechanical properties testing by GLEEBLE 3800 system: PocketJaw, Hydrawedge II, MaxStrain (multi-axis hot deformation system and obtaining the large accumulated deformation).
- Dilatometer DIL805A/D for stress strain function analysis and building of real time CTPc, CTPi diagrams.
- Strength testing machine ZWICK Z/100 with furnace (100kN) and Instron 5969 testing machine (50 kN).
- Two hydraulic vertical presses: PWH-250r and PHM 250C (2,5MN) for extrusion and forging processes and also to consolidation of powders.
- Metallographic microscope Nikon Eclipse MA 200.
- Laboratory rolling mill Duo 300 mm with reverse and possibility of asymmetric rolling plates and bars with interop heat treatment of different materials (steel and non ferrous alloys).



- Three-high skew rolling mill RSP 14/40 for bar rolling with possibility of severe plastic deformation.
- Isostatic press HIP AIP8-30H-PED for compaction and sintering and synthesis of powder samples at high temperatures and pressures with protective atmosphere (Ar, N). The press is equipped with graphite furnace with maximal temperature 2200 °C and dimensions Ø100x200 mm. Working pressure of the gas is 207 MPa. The important properties of the press is full control of heating temperature (max. 40°/min in the temperature range: 200÷1500°C) and cooling temperature (up to 40 °/min).
- High temperature laboratory furnace SPS 10-4 by Thermal Technology LCC for the advanced processing of metal powders, metals, ceramics, glass, quartz and crystal growing. The furnace can work with maximal temperature of sintering process 2400°C with simultaneous pressing up to 100 kN. The furnace works with protective atmosphere. The maximum dimension of the sample Ø 50mm. Urządzenie połączone z komputerem sterującym i kontrolującym parametry: kontrola siły prasowania, kontrola przemieszczenia stempla, kontrola temperatury, kontrola sposobu nagrzewania.
- Software for numerical modelling of heat treatment and metal forming.
- ⑦ Drum-type drawing machine.

Description of professional orientation of working sites:

- Numerical modeling of complex plastic forming processes allowing applications accepted conditions of the process for physical modelling.
- Compilation of several plastic forming methods such as extrusion and drawing methods with interop heat treatment makes possible to obtain a super-fine grained material.
- Asymmetrical rolling and controlled cooling of steel plates
- Skew rolling process of aluminum and magnesium bars
- ECAP process of bimetal Al-Cu rods

Teaching activity - modification of range of subjects:

- Mechanical Properties of Materials subject of 5-th semester of Material Engineering course of undergraduate studies (BSC),
- Designing of Metal Forming Processes subject of 7-th semester of Metallurgy course of undergraduate studies (BSC).



Main themes: plastic working, improving the efficiency of manufacturing processes, unconventional processes of plastic working, processing of metal powders, control of mechanical properties through appropriate application of plastic working.

Solved projects

Elaboration of methodology the obtaining of ultrafine-grained and nanometric structure materials (Aluminum 1050A, low carbon steel) by alternate extrusion and multiaxial compression financed by Polish National Science Center, (2010-2012), N N508 480838.

Bimetallic Al-Cu rods (Aluminum 1050A and copper CW004A) extrusion from charge obtained by the new technologies of metal joining financed by Polish National Science Center (2009-2012), N N508 406437

Developing a method of ultra-fine-grained structures during pack rolling of plates (1050A, 2017A, 6101) financed by Polish Ministry of Science, (years 2004-2006), 3 T08A 007 27.

Analysis of the possibility of obtaining super-plastic wires with magnesium alloys financed by National Science Center in years 2012-2014

Participation in Research Projects projects:

Exchange the experiences and presentation research results in frame of International Conference: New Technologies and Achievements in Metallurgy and Material Engineering.

Educative interaction and teaching activities:

- The guest lectures of visiting professors between partners of the projects
- Modification of chosen subjects content. Modification of range of subjects:

Composites - subject of 3-rd semester of Material Engineering course of undergraduate studies (BSC), new generation materials - subject of 1-st semester of Material Engineering course of undergraduate studies (BSC), Nanomaterials and nanotechnologies - subject of 2-nd semester of Material Engineering course of postgraduate studies (MSc), Composite materials II - subject of 2-nd semester of Material Engineering course of postgraduate studies (MSc).

Students exchange in frame of Erasmus Program:

Technical Universities of Liege - Material Engineering postgraduate course,



- Universities in Cartagena and Barcelona Management Engineering postgraduate course and PhD student (Metallurgy course),
- Possibility of exchange students with all project partners Universities.
- Topics for future collaboration:
- Unconventional materials forming is possible to cooperate in such fields: preparation of powder materials (ceramics and metals), production of sintered multiphase and composed materials, analysis of powder materials with UFG and nano fraction with combined layers configuration, getting a composite and monolithic materials with nano and UFG sleeves.
- UFG structure of round (Mg and Al alloy) bars produced by skew rolling in three-high skew rolling mill.
- Extrusion and forging processes of monolithic and bimetallic materials.
- Pack rolling of pates. Packet rolling of homogeneous or bimetal plates



2.4 Silesian University of Technology, Poland

POLITECHNIKA ŚLĄSKA, Silesian University of Technology, ul. Akademicka 2A, 44-100 Gliwice, Poland, T: 032 237-10-00, RR1@polsl.pl, http://www.polsl.pl

There are 2 institutes at the Silesian University of Technology, Faculty of Materials Science and Metallurgy involved in research on obtaining the UFG materials. A scientific team at the Institute of Metals Technology deals with development of unconventional metal forming methods and material formability characteristics while a group of scientists at the Institute of Material Science identifies the effects of developed SPD methods on microstructure and mechanical properties of a deformed material. Another research group at the Institute of Metals Technology is able to provide cast stock for subsequent forming experiments.

A number of unique laboratory devices have been developed and launched at the Institute of Metals Technology for studying unconventional methods of metal forming with controlled strain path. The devices permit to perform various loading cases, such as compression with oscillatory torsion, forging aided by shear stress and rolling with transverse motion of rolls. The microstructure can be examined at the Institute of Material Science by means of light microscopes: OLYMPUS GX51 and GX71 with automatic scanning stage in X-Y-Z axes and digital recording, Hitachi HD-2300A scanning transmission electron microscope with the Schottky-emitter as well as Hitachi S-4200 scanning electron microscope (with an EBSD detector for initial microstructure examination).

dr hab. inż., prof. PŚl. Eugeniusz Hadasik

Director of the Institute of Metals Technology, coordinates the research tasks and is an expert in the field of plastometric tests that allow to obtain material formability characteristics.

Professional focus workplaces:

In the field of SPD processes our site deals with the methods of forming with controlled strain path, such as: compression with oscillatory torsion, forging aided by shear stress and rolling with transverse motion of rolls. The methods can be applied to achieve the UFG stock for subsequent, finishing forming operations or even to produce final products with the UFG microstructure. Apart from the SPD effect, an important benefit of the mentioned methods is the decrease of required load in comparison with relevant conventional forming methods.



Teaching activities:

Our site provides a number of lectures, laboratories and projects on technologies for production of UFG and nano-materials. The courses comprising relevant topics are offered in 4 fields of study: Materials science, Metallurgy, Management and production engineering, Industrial computer science.

Solved projects:

Research Project No. 3 007 T08A 30: "Development of methods for effective forming of microstructure and mechanical properties of metallic materials in unconventional metal forming processes". Project manager: F. Grosman.

Research Project No. 3 059 T08A 28: "The effect of plastic deformation under conditions of controlled deformation path on the microstructure and properties of selected materials". Project manager: K. Rodak.

Research Project No. N N507 373435: "The effect of large plastic deformation on the microstructure and properties of Cu and Al". Project manager: K. Rodak.

Research Project No. UMO-2013/09/B/ST8/01695: "Nano- and ultrafine-grained microstructure forming in CuCr and CuFe alloys using new methods for severe plastic deformation". Project manager: K. Rodak.

Research task within the Project PBZ-KBN-096/T08/2003: "New technologies for manufacturing of nanostructured metals and alloys products". Task manager: F. Grosman.

Research task: "Metal forming of magnesium alloys (precision forging, sheet metal forming, extrusion, etc.)" within the Key Project POIG.01.01.02-00-015/08-00: "Modern material technologies in aerospace industry". Task manager: E. Hadasik.

Research task: "Metal forming of aerospace aluminium and titanium alloys" within the Key Project POIG.01.01.02-00-015/08-00: "Modern material technologies in aerospace industry". Task manager: F. Grosman.

Strategy and content of possible collaboration within the consorcium

Educative interaction, teaching activities, modification of synopses of subjects you teach at your university. Our site is open to share knowledge on SPD processes and UFG materials. Contents of relevant courses conducted at our university can also be modified with all the most up-to-date information provided by concerned partners.



Involvement in student exchange programs between universities – Erasmus network, Marie Curie, etc. Our site is involved in the Erasmus network, so the student exchange is possible within this programme. The double-diploma agreement would be also an interesting option for students.

Project topics suggested for future collaboration with the current collaborators of the Nanoteam– VŠB-TU Ostrava. Offers for the projects, competences needed.

"Application of SPD processes for consolidation of porous materials". Offer:

- conducting experiments on our laboratory devices for SPD processes
- development of material formability characteristics

Competences needed:

preparation of metallic powders

"The effect of severe plastic deformation on formability and functional properties of Mg-Li alloys". Offer:

- preparation of stock for SPD processes
- development of material formability characteristics
- conducting experiments on our laboratory devices for SPD processes

Competences needed:

conducting the other SPD experiments (e.g. ECAP)



2.5 SVÚM a.s., Praha, Material research and testing centre

SVÚM a.s., Tovární 2053, 250 88 Čelákovice, oddělení neželezných kovů – vedoucí oddělení Ing. Vladivoj Očenášek, CSc., T: +420 274023172, F: +420 222729256, http://www.svum.cz

2.5.1 Presentation of the working site of the SVÚM a.s.

The company SVÚM a.s. was founded on 1st January 1994 by privatisation of the National Research Institute of Materials in Prague (SVÚM). This institute was founded in 1949 and gradually developed into a leading research centre in the field of metallic and plastic materials and their testing. Privatisation in 1994 preserved the original acronym SVÚM along with the graphical trade mark. The company SVÚM a.s. is a private research organization, the main activity of which is research and development of metals, plastics, composites and testing of their properties in accredited laboratories.

The company SVÚM a.s. regularly participates in research projects supported by the Ministry of Education, Youth and Sports, the Ministry of Industry and Trade, the Technology Agency of the Czech Republic, the Grant Agency of the Czech Republic, as well as in international projects supported by the European Union (Framework Programmes, COST, EUREKA, etc.).

The main activities of research and materials testing centre are the following:

- Research and development activities, basic and applied research (metals, plastics, composites)
- Testing accredited laboratories according to the standard ČSN EN ISO / IEC 17025 certification by the company General Electric Transportation-Aviation
- Welding Testing organisation No. 2 CWS ANB for testing of welders, inspection of welded structures according to the standard ČSN EN ISO / IEC 17020, certification of welding components
- Publishing activities Documentation newsletters in the field of materials, processing, literature searches
- Technology and Production Laboratory for testing of strength (No. 1151) in the Department of strength, Creep testing laboratory (No. 1151.1) in the Department of creep

The company SVÚM a.s. is the beneficiary or participant to many projects of various types (TA, GA, FR, OE, FT). It is also investigator of several international projects, framework projects (FP5, FP6, FP7), EUREKA and COST projects.



INVESTMENTS IN EDUCATION DEVELOPMENT Ing. Vladivoj Očenášek, CSc.

ocenasek@svum.cz

Ing. Vladivoj Očenášek, CSc. works in materials research in the field of non-ferrous metal since 1971. During this period he was investigator of numerous projects funded by industrial non-ferrous metals, as well as projects supported by the Government (Ministry of Industry and Trade, GA CR, Ministry of Education, Youth and Sports). Among these projects were during last years e.g. the projects No. FA-EV / 064 "Increasing the utility properties of products made of non-ferrous metals and their alloys," No. 109/96/0957 "Structure conditioned properties of aluminium alloys after the model forming", No. 106/00/1485 "Anisotropy of the fatigue properties of pressed pieces made of aluminium alloys", No. 106/00/1486 "Effect of Sc alloying on the structure and properties of the alloy system AIMg3", No. 106/04/1353 "The influence of conditions of solid solution decomposition on the structure and properties of the system AI-Mg-Sc-Zr". In the period 2004 to 2008 he was investigator of the project 1M0556 "Ecological centre of applied research of non-ferrous metals".

He worked from 1971 to 2009 at the Research Institute of Metals. Since 2010 he is employed in the company SVÚM a.s.

As the head of the Department of non-ferrous metals and alloys he is engaged in basic, as well as in applied research related to technology and use of products of non-ferrous metals and their alloys. The research is focused mainly on aluminium, copper and magnesium for applications in electrical engineering, electronics, transport engineering and civil engineering.

The research activities are focused on the use of and preservation of the relations between the structure, properties, and technologies. In the case of technologies it does not concern only production technologies, but also the technological processes used by users of products made of non-ferrous metals, which can significantly affect the functional characteristics of the final product. This concerns mainly the structure evaluation (by light and electron microscopy) and evaluation of mechanical and fatigue properties (universal testing machines).

In addition to research activities the centre provides in the field of non-ferrous metals and their alloys also material analyses, analyses of operational problems and accidents related to material, technology development and optimisation of parameters of technological processes (extrusion pressing, rolling, forging, casting), use of a comparison of national and international material standards and consulting services in these areas.



Teaching activities:

External lectures at the ČVUT FS and VUT Brno, non-ferrous metals and their applications in non-ferrous metals technologies, application of mathematical statistics in materials science, structure and properties, materials fatigue.

Strategy and content of possible cooperation after termination of collaboration within the consortium:

After completion of the project the company SVÚM a.s. and its employees can participate in the preparation and solution of projects aimed on UFG and SPD, especially in the field of structural analyses and analyses of mechanical, fracture and fatigue properties. The company does not have at present experimental equipment, which would make it possible to perform deformation experiments leading to the formation of ultra-fine grained structures.

The company SVÚM a.s. is a public limited company engaged in applied and basic research. It may participate in educational activities in the form of lectures or by preparation of selected topics for the lecture notes. This concerns in particular the area of applications of the deformation processes and related heat treatment. This activity can be also realised in the form of cooperation at the education of students (preparation of diploma theses).

On the basis of participation at solution of the current project, under numerous results from the field of UFG and SPD were presented, and on the basis of the possibilities available at the working site of the company SVÚM a.s. the future cooperation can be realised at preparation of projects, which would address the SPD. This concerns particularly use of the SPD at the preparation of ultra-fine grained structures of hardenable Al or Mg alloys. This concerns specific structures, where the strengthening provided by the SPD processes can be combined with hardening by precipitating phases. The combination of deformation and heat treatment offers many possibilities of combining these two processes in order to obtain a variety of structures and thus numerous specific properties. The company SVÚM a.s. offers in this area many years of experience in the field of non-ferrous metals. It unfortunately cannot currently offer for this area experimental equipment for the SPD.



2.6 Charles University, Faculty of mathematics and physics, Department of materials physics

Univerzita Karlova, Matematicko-fyzikální fakulta, Katedra fyziky materiálů, Ke Karlovu 5, 121 16 Praha 2, T: +420 22191 1358, 22492 3450, F: +420 22191 1490, E: mfkfk@met.mff.cuni.cz, http://material.karlov.mff.cuni.cz

2.6.1 Presentation of the working site of the Charles University, Department of Materials Physics

Doc. RNDr. Miloš Janeček, CSc. is Head of the department. The department addresses several research projects financially supported by the GAČR and TAČR. The department is also involved in international scientific projects. Broad international cooperation is also organic part of its scientific activities. The department organises regularly international conference International Symposium on Physics of Materials (ISPMA) and is also involved in organisation of the "Meeting of PhD students" both from the Czech Republic and Austria, Hungary and the Slovak Republic.

Professional focus of the Department of Materials Physics is very extensive as it deals with the issues of used materials, as well as of used experimental methods. The focus of the department can be briefly described as follows: Study of aluminide Fe3Al. We investigate its micro-structure, deformation behaviour at high temperatures, including creep, and the influence of admixture atoms. We obtained some original results.

Another area concerns the study of super-plastic behaviour of selected aluminium alloys. This includes the research of deformation behaviour of the aluminium alloy 7075 with ultra-fine grains, prepared by ECAP, at high temperatures. Micro-structure and deformation behaviour were studied also in other aluminium alloys (which were not super-plastic), such as types 2618, 6082 or AW 3003.

Big attention is devoted to the study of the micro-structure and properties of ultra-fine grained (UFG) metallic materials - Cu, Cu-Zr, various aluminium alloys, magnesium alloys - prepared by severe plastic deformation (SPD) methods, such as ECAP, HPT, ARB. Several projects deal with examination of the micro-structure, mechanical properties and deformation behaviour of magnesium alloys prepared by various methods, such as rolling, extrusion, ECAP, high pressure casting. The influences of the grain size, deformation temperature and manner of loading on the properties of the material are also investigated. In composites the influences of the size and volume fraction of ceramic particles on their properties are also studied. Results of this are reflected in the publications. It should be emphasized that several complementary experimental methods are used for the study of these properties of magnesium alloys. Very often acoustic emission, neutron diffraction, X-ray diffraction, TEM, SEM, EBSD.



INVESTMENTS IN EDUCATION DEVELOPMENT prof. RNDr. Pavel Lukáč, DrSc.

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Charles University is divided into 17 faculties. One of them is the Faculty of Mathematics and Physics, which is divided into three sections - physics, informatics and mathematics. My working site of is the Department of Materials Physics. The scientific activities of the department are focused mainly on the study of the structure, micro-structure, mechanical and thermal properties of metals, alloys, intermetallic compounds, ultra-fine grained materials, nano-materials and metal matrix composites. Part of the research activities is a comprehensive research of the physical nature of plastic deformation involving experiments, modelling and theory. An integral part of the research is the study of phase transformations and their effect on the properties of the investigated materials.

Prof. RNDr. Pavel Lukáč, DrSc., a member of the European Academy of Sciences - as a person involved in the project – presents his scientific degrees and scientific-pedagogical titles: My scientific-research activities are extensive and permanent. It began by detailed examination of the patterns of plastic deformation of single crystals of hexagonal metals having a low melting point, namely of zinc, cadmium and magnesium. Important investigation was devoted to thermally activated processes during the deformation of the single crystal in the low temperature range (77-300 K). This was organically linked to the studies of the effect of substitutional atoms on concentration dependence of the critical slip stress in single crystals based on Mg and on Cd in a wide temperature range. Publications may serve as demonstration of a wide range of obtained results. I obtained very valuable results at deformation at low temperatures (in the region of helium temperatures). It was shown that the critical slip stress of cadmium and magnesium single crystals increased proportionally with the C^{2/3}, where c is the concentration of substitutional atoms. The factor of proportionality is dependent on the combination of relative change of the lattice parameter and relative change in of elastic constants in dependence on the concentration of substitutional atoms. I progressively moved to the study of plastic deformation of poly-crystals of alpha zirconium and of commercially pure titanium. I began physical research of the conditions of super-plasticity of Zn-Al alloys, which later passed to the study of super-plastic behaviour of the aluminium based alloys. My special attention was focused on the deformation behaviour and mechanical properties of aluminium alloys and magnesium-based alloys at various deformation temperatures (ambient and higher temperatures). I tried to explain the deformation behaviour as a result of dislocation processes, which could be affected by the temperature (strengthening and softening mechanisms), by admixture atoms and also by diffusion. Development of the theory made it possible to create a model explaining the discontinuous deformation, the Portevin-Le Chatelier effect. Occurrence of this phenomenon is sensitive to the deformation temperature and the strain rate. I explained







this phenomenon in aluminium alloys, and this explanation was accepted by the scientific community, it was used for explanation of the Portevin-Le Chatelier effect also in other alloys. Recently I studied the micro-structure, mechanical properties (their anisotropy) and deformation behaviour of magnesium alloys. The deformation behaviour of magnesium alloys is strongly influenced by the activity non-basal slip systems and by twinning. I was able to determine the activity of non-basal dislocations in magnesium in dependence on the deformation temperature [17] by using the X-ray diffraction. It has been demonstrated that the activity of the <c+a> dislocations in a pyramidal slip system increases with the increasing temperature. As one of the non-destructive methods I used acoustic emission, both for detection of the formation of new dislocations and twinning, and also for identification of discontinuous deformation. I studied the mechanical and thermal properties of composites based on magnesium alloys, including nano-composites. I was involved also in the research of deformation behaviour of Al alloys with ultra-fine grain (plastic anisotropy). I observed and explained a different type of deformation behaviour of AZ31 magnesium alloy with ultra-fine grain, prepared by ECAP and deformed along different directions.

Teaching activities:

As part of my educational activities, I created two lectures - "New materials and new technologies" and "Modern Problems of Materials Physics," which included, among other things, methods of production of ultra-fine grained materials, nano-materials and composites.

Strategy and content of possible cooperation after termination of collaboration within the consortium:

In the context of educational interaction we offer the possibility to participate in possible adaptation of the curriculum in the subjects related to the issues addressed in the project "Nanoteam VŠB - TU Ostrava" and the ability to assess the theses and doctoral dissertations. I can imagine at the future cooperation with the existing participants of the Nanoteam - VŠB-TU Ostrava the following projects: Preparation of metallic alloys with ultra-fine grain and Preparation of nano-crystalline metallic alloys. I would recommend to limit ourselves just to the three methods of severe plastic deformation: ECAP, HPT and ABR. I would recommend to observe: anisotropy, mechanical properties, the stress dependence of strengthening coefficient, the effect of texture on the investigated properties. The following could be a suitable theme: Sample preparation of metallic alloys by the ECAP method with simultaneous action of ultrasound. We should observe the impact of ultrasound on deformation behaviour of the samples prepared after several passes. Effect of ultrasound on dynamic recrystallisation.



2.7 Technology park Chomutov o.p.s.

Technologický park Chomutov o.p.s., Cihlářská 4132, 430 03 Chomutov, ČR, T: +420 474 622 531, http://www.tpcv.cz

Technology park Chomutov (TPCV) is an institution, which provides already for 10 years both operation of the plant at the Cihlářská street facility, Chomutov, but which is devoted mainly to promotion of entrepreneurship by providing or by direct participation in EU projects already from the times before accession of the Czech Republic to the EU structures. The main emphasis is placed on cooperation with university and scientific-research working site in the Czech Republic, and due to the location also to cooperation with the technology centres and universities in the Saxony region. So far we used for the project of nano-technologies and unconventional forming of material the capacity of the TPCV leading collaborator in the area of creation of projects - Ing. Miroslav Krtička PhD, and moreover our contacts with the German working sites in the area of Chemnitz and Dresden. The contractual relations with the Office of industrial and intellectual property and with the Inovacentre of the Technical University in Prague (ČVUT) can be appropriately used as another information resource for the project and its further integration into scientific networks.

Ing. Josef Hassmann, CSc. a Ing. Miroslav Krtička, Ph.D.

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The persons directly involved in the project were already mentioned - Ing. Miroslav Krtička PhD. He originally worked at the TC AV ČR, and he went to work on the project Mateo with the TPCV. This project was the first project of the R&D character, which was approved by the EU for the Czech Republic and the beneficiary of which was finally the region "Southwest" and the TPCV ensured its administration, of which Ing. Krtička was in charge. Afterwards a series of projects followed, for which we ensured both administration and concrete solutions. Ing. Krtička as the most familiar with the issues of EU projects, as well as with the preparatory phase, at that time ensured information for the project, i.e. what projects and of what character were being prepared and would be the most appropriate for the fulfilment of the project. In this sense it is possible to continue the project or to use his experience gained at the development and applications of the projects for consultations or for direct participation at the development of other projects.

Ing. Josef Hassmann CSc., Director of the Technology Centre Chomutov, is the second person. This worker has rich experience thanks to extensive work on practical applications of technological processes, including the period of educational activities. He was one of the 12



first founders of the higher education sector in the Czech Republic. He holds currently position of the Managing Director of the company HS Projekt, which realises applications of control systems in technological processes, and at the same time he is also director of the Technology Park Chomutov, which cooperates with a plethora of universities and scientific research centres in the Czech Republic and abroad, especially in Germany. For the purposes of the project, with regard to his orientation, we regard as promising a cooperation with the Chemnitz branch of the Frauenhoff Institute. This working site is focused particularly on the areas forming of materials, on various technological processes, it has very close cooperation with the TU Chemnitz. The second institution is the Material Research Network Dresden. It represents in the field of material engineering an integration of all institutions and university departments working in this field in the Dresden region. All contacts were already continuously handed over to the VŠB-TUO.

Teaching activities:

Technology park does not exercise direct educational activities, this working site can participate for example in workshops focused on technology transfer and on innovations in the field of interest.

Strategy and content of possible cooperation after termination of collaboration within the consortium:

As it was already described above, the Technology park is an institution, which is able to participate in the future continuation of the project, or at networking, rather than participate directly in research. It can, however, participate indirectly at creation of new activities by searching new opportunities and contacts, as well as by creation of international networks for the purposes of this project.

We expect that contacts will be in future maintained mainly by visits and by participation in professional events on both sides. The nearest event, to which the VŠB-TUO workers will be invited, will be the workshop devoted to cooperation between universities and industry, which will be realised in cooperation with Innovacentre of the Czech Technical University in Prague (ČVUT). Its preliminary date has so far been determined on 26th February 2014. It will be held in Prague and the representative of the Materials Research Network Dresden also promised to attend it.

Technology park is unable to provide direct educational interaction. However, through its contacts it can provide contacts and meetings with workers of other university departments, and through the Innovacentre it can offer close contacts with the ČVUT and of course with the staff of TU Chemnitz and Dresden. Within the possibility of exchange of students we



recommend to focus on the Frauenhoff Institute Chemnitz. If we manage to establish regular contacts and cooperation, this Institute accepts students for internships before graduation or within doctoral studies. Such contacts have already been established by the TU Plzeň and in that case regular cooperation and internships are already running in regular manner.

The possible extension of the project activities in the future could focus on the methods for detection defects in materials. In this case, besides the above mentioned persons and institutions (especially foreign ones) the personnel of the NDT of companies, which are closely linked to the Technology Park (as the continuator of the former ČEZ Materials Centre in Chomutov), could also participate. These activities have already been discussed during the visit to the VSB and topics interesting for both parties can undoubtedly be found.



2.8 VÚHŽ a.s., Laboratories and testing rooms

VÚHŽ a.s., Laboratoře a zkušebny, 739 51 Dobrá 240, ČR, T: +420 558 601 111, F: +420 558 601 211, E: vuhz@vuhz.cz, http://www.vuhz.cz

The company was founded on the 1st April 1948, then under the name of the Iron and steel research Institute (VÚHŽ), based in Prague. In the year 1972 it moved to Dobrá near Frýdek-Místek. A research and development centre for production of prototype equipment for metallurgical enterprises was built. Research Institute was also engaged in the production of small series of automation and measuring instruments for these companies. In May 1992, the Iron and steel research Institute was reorganised by the privatisation program into a joint stock company, which has become a manufacturing and trading company with a technological focus. In May 2007, the 100% stake in the parent company VÚHŽ a.s. was purchased by the steelmaking company TŘINECKÉ ŽELEZÁRNY, a.s.

At present the company VÚHŽ a.s. has several manufacturing business units / divisions (automation, tool shop, special sections rolling mill, foundry for casting of centrifugally cast sections, laboratories and testing rooms). Each division, in addition to its commercial activities, is also engaged in research and development focused mainly on innovation of the existing and on implementation of new products and services.

The key activities of the comapny VÚHŽ a.s.:

- metallurgical production (centrifugal casting, hot rolling of sections)
- mechanical production (machines and lines for small series production, sound insulations and covers)
- melting, regulation and automation technology of industry
- research and development of new materials and technologies, accredited testing rooms, consultancy and expert studies

The company VÚHŽ a.s. is focused particularly on small-batch production, mainly on metallurgical production for export. The turnkey projects according to the specific customer requirements are preferred. The offer comprises also services (research and development of new materials and technologies, accredited testing, consultancy and expert studies). At expert consultation our specialists analyse the problem and then offer a proposal, or development of optimal material production technology and processing for achievement of the desired service properties and concrete proposals for achievement of real savings of production costs, for reduction or elimination of negative environmental impacts of the clients' manufacturing activities, etc.



The problem-solving activities in the field of nano-technologies and unconventional forming of materials are provided by the divisions "Coating centre" (plasma coating) and namely the laboratories and testing rooms (including research and development methods, evaluation of the materials properties with UFG structure).

The laboratories and testing rooms are accredited for the following areas: chemical analyses of metals, of waste, water and liquors; testing: corrosion, metallographic, mechanical; measurement of radioactivity and determination of radio-nuclides. In addition to the analytical works and testing the activities of this section focuses on solving a number of problems in the field of materials and corrosion engineering – at applications of metallurgical products, research and development works, expert studies and consultancy activities, etc. Given the focus of the workers – specialists, the offered services are of complex nature in connection to the wide testing base.

Ing. Karel Malaník, CSc.

malanik@vuhz.cz

Ing. Karel Malaník, CSc. works in the company VÚHŽ a.s. (formerly Iron and Steel Research Institute) since 1977 as a researcher or scientist in the fields of chemical phase analysis, corrosion and electrochemistry. He presents the results of his work not only in Czech Republic, but also abroad. Since 1999, he is director of the division "Laboratories and testing rooms" of the company VÚHŽ a.s. He is member of numerous professional societies - Scientific Society for the Metal Science, Czech Society for New Materials and Technologies, Association of Corrosion Engineers, ASM International. He acts as an assessment expert at EC - RF Coal & Steel. He has extensive experience with solution and coordination of research and development projects as a investigator and co- investigator.

On the basis of his knowledge and experience he proposes the concept and objectives of research activities, he participates in coordination and solution of tasks within the proposed objectives. He develops research and development methodologies for material testing, evaluates the obtained results of complex chemical, phase and corrosive characterisation of materials, including the interpretation of the obtained results, elaboration of reports and proposals of procedures for further solution. The issues related to SPD, materials with UFG structure and nano-materials are in the laboratories and testing rooms dealt with in the laboratory of mechanical properties and in the metallographic laboratory. The working site uses advanced experimental basis enabling evaluations of UFG and nano-materials in terms of their mechanical properties, chemical composition (including elemental profile analysis, structural characteristics, local micro-analyses; it has at its disposal SEM with micro-analytical systems EDS, WDS and EBSD) and corrosion properties.

Teaching activities:

In the field of development of technologies for production of UFG and nano-materials no teaching activities. Lecturing at the Academy JAK oriented on "Research and development system in the Czech Republic and the EU for Andragogs" was terminated in 2010.

Strategy and content of possible cooperation after termination of collaboration within the consortium:

No educational interaction, educational activities, involvement in adaptation of curricula in the subjects is assumed. A possibility is offered to participate in the sharing of experience with the processing and evaluation of projects EU R & D projects (7th FP and RF Coal & Steel). Another possibility for future cooperation with the existing staff of the Nanoteam - VŠB-TU Ostrava consists in participation in international R & D projects, in which it would be possible to use the experience gained during activities at EC as an independent expert for assessment of the project applications under the FP7 (FP7-NMP-1.4-3 "Tools and methodologies for imaging structures and composition at the nanometer scale"), and the Research Fund of Coal and Steel (TGS5 related Proposals Finishing and coating). In this case it is possible to use the knowledge and experience gained at evaluation of the project applications (for the cases of single-stage and two-stage selection procedure). In particular, how to proceed at selection of the program in relation to the issues being addressed, and the related creation of the project concept, determination of objectives, procedure for their achievement, selection and involvement of individual participants, structure of the project and content of WP, financial aspects, including principles of filing of the application, etc. Recommendations on what to focus and how to present the objectives in the application, so that the independent experts have at their evaluation at the first glance to the relevant parts of the application a clear information required by the evaluation criteria. This concerns assessment of the level of scientific and technical approach of the applicant, innovative contents, consistency of resources and quality of partnership, application potential for industrial practice and added value for the EU. This experience was gained during preparation of applications for R & D projects, including preparation of applications for selection procedure - for example experience with the application into the EU project (EURATOM), with the management and solution of the projects program EUREKA, role of coordinator of the international project E!2335 Reg. No. OE-82

We can offer also the opportunity to use the experience with preparation of applications and solution of the projects of national R & D programs - especially from projects of VaV MPO [R&D MIT] (programs "Permanent Prosperity", "Impuls", "Progress", "Tandem", "Pokrok"), Ministry of Education, Youth and Sports (EUREKA) and TAČR (ALFA) - (principal investigator, or co- investigator, member of the research team).

2.9 Material and Metallurgical research s.r.o.

MMV s.r.o., Pohraniční 693/31, 706 02, Ostrava – Vítkovice, ČR

Ing. Josef Bořuta, CSc.

Josef.boruta@seznam.cz

The company MATERIÁLOVÝ A METALURGICKÝ VÝZKUM s.r.o. was for a long time former working site of Ing. Josef Bořuta, CSc., but he now no longer works in this institute, but has very good contacts with this working site, especially with the plastometric laboratory in the area of research of forming in the metallurgy department. Professional specialisation of Ing. Josef Bořuta is focused on research of forming and on the field of physical and mathematical simulation of forming processes. The following belong to the main activities carried out within the framework of applied research and development:

- research of formability of hot formed materials in laboratory conditions
- research of basic deformation characteristics of hot formed materials and preparation of data for the databases of deformation behaviour intended for numerical simulation using the finite element method (FEM)
- physical simulation of hot forming processes and investigation of structure-forming processes (universal torsion plastometer SETARAM, universal rolling mill for production of seamless pipes)
- numerical simulation of cold and hot forming with use of the finite element method, equilibrium phase composition and kinetics of phase transformations by CALPHAD method
- research conditions for strengthening, dynamic recrystallisation and post-dynamic recrystallisation processes of hot forming of special materials
- design, research, development and optimisation of forming technologies, including controlled processes of forming by modern technologies of thermo-mechanical and normalising rolling and controlled rolling and open die forgings, including heat treatment

Teaching activities:

Teaching activities are oriented mainly on cooperation with the Technical University of Ostrava (VŠB-TUO), both with the Department of forming at the Faculty of Metallurgy and Materials Engineering, and with the Department of Mechanical Technology at the Faculty of Mechanical Engineering, especially through guiding and opposition procedures for theses, and during the last twenty years, particularly for PhD theses. He partly opposed doctoral theses at the Technical University in Prague (ČVUT) and at the TU Košice.

Strategy and content of possible cooperation after termination of collaboration within the consortium:

Possibilities of future cooperation on the following topics:

- Plastometric research in the area of obtaining of nano-structured states in steels and in unconventional materials.
- Experimental research on hot and cold formability of steels and unconventional alloys, carbon steels, alloyed steels and stainless materials, or non-ferrous metals.
- Research of the possibilities of enhancement of metallurgical formability of alloyed steels, heat resistant steels, stainless, austenitic, ferritic, martensitic, super-ferritic and super-austenitic steels, or also high carbon tool steels and high speed steels.
- Operation of the torsion plastometer SETARAM-Vítkovice-MMV, physico-metallurgical research oriented on hot formed metallic materials, particularly of steels.
- Professional cooperation with the formerly corporate and currently regional research centre in Ostrava-Vítkovice (MMV, s r.o.) with technical universities in Ostrava (VŠB-TUO) and Košice (TU Košice). Traditional areas of plastometric testing of the deformation behaviour of steel materials at hot forming, particularly at processes of steel rolling and forging, were gradually extended also to other metallic materials, including non-ferrous and light metals.
- The temperature range of investigation has also lately been extended even to so far experimentally poorly verified temperature interval, both in the upper region of the forming interval communicating with the conditions of continuous casting, and in the lower region in connection with the accelerating study of conditions of controlled rolling and cooling.

Within the possibilities of exchange / cooperation of students, it is possible to realise exchange of students of master and doctoral study programs, naturally upon agreement with the management of the company MMV s r.o., which currently collaborates with the Technical University of Ostrava within the Regional Materials Science and Technology Centre.

Other possibilities of cooperation are focused on the following:

- Creation of a consortium for solution of research projects of applied research.
- Monographs, or chapters in the book on plastometry and physical modelling of forming processes
- Lectures and courses dealing with plastometry.
- Lectures on the effect of the chemical composition, structure and strengthening of carbon and low-alloyed strip steels on mechanical properties and cold formability.
- Guiding of theses, or cooperation at the education of students in doctoral study programs, etc.

Commercialisation of the results of applied research, preferably with the application of various objects of intellectual property.

2.10 HVCC s.r.o.

The company HVCC s.r.o. with its global presence with branches in the Czech Republic is considered as one of potential partners at determination of strategy of the Nanoteam VŠB - TU Ostrava. The company HVCC s.r.o. is a company, which can provide testing capabilities in terms of vibration, pulsation, temperature and corrosion tests. The company HVCC develops cooperation with universities and is able to develop the components for air-conditioning systems on an international basis. The company is able to develop air-conditioning systems as a complete entity. Its customers include the world class manufacturers of cars and automotive systems.

Ing. Marcel Klos, Ph.D.

klos.marcel@seznam.cz

He has achieved his PhD degree in Engineering Technology in are of forming. He combines knowledge of increasing the multiple plastic deformation and ECAP technology and super-structure technologies in this area. He is employed at the company HVCC as a development specialist. Active cooperation with the companies Hytech s.r.o., solution of the projects within the EU. The company I2M - collaboration as a senior lecturer. He currently works on his doctoral thesis, which should be completed in 2014.

Laboratories of the company HVCC can test fine-grained materials in terms of vibrations, when the required sample is a part of the whole. It is possible to test the corrosion effects at various concentrations and composition. At present the test are being prepared of an assembly made of the material 6061 T6 based on UFG as a replacement of the existing components based on austenitic steels. The component serves as a functional unit of the heat exchanger for an alternative drive of vehicle.

Teaching activities:

Teaching of the subject "Forming", implementation of unconventional forming methods with use of UFG technologies and processes into the subject. Use of new technologies in the company HVCC.

Strategy and content of possible cooperation after termination of collaboration within the consortium:

In the context of maintaining of contacts after completion of the project, the best option seems to be the possibility of planning of joint conferences and presentations of the achieved results both at these meetings, and in the companies.

Another possibility of closer cooperation can be found in exchanges and integrating of young specialists from the VŠB - TU Ostrava into industrial practice, and especially inclusion of young specialists from the perspective of implementation of technologies into practice.

One of the possibilities for the Nanoteam VŠB - TU Ostrava is finding a strategic partner and therefore a co-investigator from the industry with the possibility of testing capacities with global reach. The Nanoteam should focus on a specific industrial segment with an untied economics of production processes.

3. DESCRIPTION OF THE NANOTEAM VSB-TU OSTRAVA DURING THE PROJECT

3.1 Realisation of key activities – KA01 a KA02

Within the key activities one and two we developed and realised courses focused thematically on the preparation and participation in international R & D projects, and other education of the workers of the Nanoteam VŠB-TU Ostrava in the area of R & D legislation and protection of intellectual property. In each course altogether 30 people were successfully trained. Out of this number of trained persons - 10 were academic staff and 20 students.

Created and realised courses:

KA01 – Preparation of participation of the Nanoteam VŠB – TU Ostrava into international networks and projects in the research and development area.

- International projects in the research and development area (COMTES FHT a.s.)
- Best practices in the area of application for international research and development projects (COMTES FHT a.s.)
- Project realisation in the research and development

KA02 – Continuing education of workers of the Nanoteam VSB – TU Ostrava in the area of research and development legislation and protection of intellectual property in international projects.

- Legislation of research and development projects
- Intellectual property in the area of international research and development projects

From all the training courses, which were created within the KAO1 and KAO2, we created educational materials designed for academic staff and for students in such a manner, that they form a practical manual for realisation of these activities. These teaching aids were printed within the funds for the project with registered ISBN number, and their electronic version was stored in the communication portal of the project "Nanoteam VŠB - TU Ostrava" - see http://nanoteam.vsb.cz.

3.2 Events organised by the VSB – TU Ostrava within the project – KA03

KA03 – Support of intersectoral mobility of the Nanoteam VŠB – TU Ostrava.

Within the project "Nanoteam VŠB – TU Ostrava" and the key activity No. 3, mutual interaction of the scientific and research team with the industry and international business environment was supported thanks to the organisation of several professional meetings. It concerned particularly organisation of workshops, professional discussion forums, seminars and conference COMAT 2012. Active participation in international scientific conferences and short-term stays abroad formed integral parts, which presented the outputs of the project activities and the work of the scientific-research team.

1st Professional discussion forum – topic: "Nano-technologies"

1st Professional discussion forum took place from 15th to 16th November 2011 in Ostravice. Altogether 15 academic staff and 15 students from VŠB – TUO and ZČU Plzeň participated in and supported this professional discussion forum entitled **"Nanotechnologies"**. Representatives of industry, who are involved in the project "Nanoteam VŠB – TU Ostrava" at positions of experts, also participated in this event.

2nd Professional discussion forum – topic: "New technologies"

2nd Professional discussion forum took place from 26th to 27th September 2012 in Hukvaldy. Altogether 15 academic staff and 15 students from VŠB – TUO and ZČU Plzeň participated in and supported this professional discussion forum entitled **"New technologies"**. Representatives of industry, who are involved in the project "Nanoteam VŠB – TU Ostrava" at positions of experts, also participated in this event.

3. Professional discussion forum – topic: "Sustainable development and applied research"

3rd Professional discussion forum took place from 17th to 18th October 2013 in Malenovice. Altogether 15 academic staff and 15 students from VŠB – TUO and ZČU Plzeň participated in and supported this last professional discussion forum entitled **" Sustainable development and applied research"**. Representatives of industry, who were involved in the project "Nanoteam VŠB – TU Ostrava" at positions of experts, also participated in this event.

1st Workshop – topic: "What I can to offer"

1. The workshop took place from 2nd to 4th February 2012 in Trojanovice. The meeting was attended by outstanding scientists form abroad dealing with the issues of super-plasticity, unconventional forming of materials and with nano-technologies. This event was supported also by presence of 20 academic staff and 20 students from the VŠB – TUO and ZČU Plzeň.

Altogether 8 specialists form abroad participated at this workshop from the organisations collaborating on the project "Nanoteam VŠB – TU Ostrava", namely from: Universität Münster (DE), Institut de Chimie et des Materiaux of the Academy of Sciences in Paris (FR), Politechnika Czechostowska (PL), Žilina university (SK) and Instytut Metalurgii i Inżynierii Materiałowej PAN in Cracow (PL). Moreover 5 experts from industry, who are also involved in this project, also participated in this event, namely from: VÚHŽ a.s. (former Iron and Steel Research Institute), Visteon – Autopal Services s.r.o, SVÚM a.s. (former State material research institute), VÍTKOVICE – Material & Metallurgical research Ltd. and VÚK Panenské Břežany a.s., Research Institute for Metals.

2nd Workshop – topic: "New trends"

2nd Workshop took place from 21st to 23rd February 2013 in Kopřivnice. The main topics of this workshop were **"New trends"** in mechanical engineering. The meeting was again attended by numerous foreign experts from partner organisations – Universität Münster (DE), Politechnika Czenchostowska (PL), Žilina university (SK) and Instytut Metalurgii i Inżynierii Materiałowej PAN in Cracow (PL). It was attended also by 6 experts from industry, who are also involved in this project, also participated in this event, namely from: VÚHŽ a.s. (former Iron and Steel Research Institute), Visteon – Autopal Services s.r.o, SVÚM a.s. (former State material research institute) and Material & Metallurgical research Ltd. It was supported altogether by 20 academic staff and 20 students from VŠB – TUO and ZČU Plzeň.

The 2nd workshop included also a discussion panel **"Strategy of Nanoteam"**, dealing with formulation of strategy and future action of the professional team. All the workers of the Nanoteam VŠB – TUO, as well as other participants from Czech Republic and from abroad actively participated in the discussion. A report was drawn from the discussion panel, which documented all the discussed items of strategy and it was distributed to all interested workers of the project.

3rd Workshop – topic: "The EU Framework programmes – our future"

 3^{rd} Workshop took place from $6^{th} - 8^{th}$ February 2014 in Ostravice. The main topic of this workshop was "The EU Framework programmes – our future ".

Large number of specialists from Czech Republic and from abroad participated in the third and last workshop, organised within the frame of the project "Nanoteam VŠB – TU Ostrava", who deal with ultra-fine grained materials, nano-materials and unconventional forming of materials.

The following foreign experts presented their papers at this workshop: Prof. Gerherd Wilde (Germany), Dr. Loïc Perrière (France), Dr. Yannick Champion (France), Prof. Jan Dutkiewicz (Poland), Dr. Wojciech Maziarz (Poland), Mgr. Marek Tkocz (Poland), Dr. Berski (Poland), doc. Tibor Donič (Slovakia), Dr. Tomasz Tański (Poland). Other foreign participants included Dr. Teresa Bajor (Poland), Milan Martikán Ph.D. (Slovakia), Prof. Eugeniusz Hadasik (Poland), Prof. Franciszek Grosman (Poland).

The Czech Republic was represented by the papers read by Prof. Stanislav Rusz, Prof. Radek Čada and RNDr. Marie Blahetová from the VŠB – TUO, Prof. Jozef Zrník and Michal Zemko Ph.D. from the company COMTES FHT a.s. and Prof. Pavel Lukáč from Charles University.

The last group, which presented their findings within the 3rd workshop, were invited experts from industry: Ing. Karel Malaník (VÚHŽ a.s.), Ing. Vladivoj Očenášek (SVÚM a.s.), Tomáš Kubina Ph.D. and Ing. Josef Bořuta (MM Výzkum s.r.o.), and Marcel Klos Ph.D. (HVCC).

Expert lectures presented during the workshop were focused on the issues of UFG materials, nano-materials, technologies for the production of these materials and on their industrial application. The lectures dealt also with methods for assessment of obtained properties, such as structure, micro-structure and mechanical properties.

Within the 3rd workshop held from 6th to 8th Fabruary 2014 foru discussion panels were held, determined for workers of the project "Nanoteam VŠB – TU Ostrava", for the partners collaborating with the university, for the company COMTES FHT a.s. – partner in the project, for the research and development centres and industrial companies, but also for students. The first two topics of discussion panels were focused on international and national conferences, shorttime internships in institutions and industrial companies abroad. Other discussion topics were focused on the possibility of participation on the projects of the types Horizont 2020, Eurostars, Ceepus, Marie Curie, as well as on the aspects of preparation of an international research project.

Following the organisation of the 3rd Workshop on the 9th February 2014 a working meeting was held, attended by staff of the project "Nanoteam VŠB - TU Ostrava." The main topic of the

meeting was to discuss the current strategy of the project Nanoteam VŠB - TU Ostrava and also future cooperation with all stakeholders (universities, research centres and companies). A communication portal http://nanoteam.vsb.cz created within the KA04 was presented. Afterwards minutes were prepared from this meeting.

From all the events organised within the project "Nanoteam VŠB - TU Ostrava", which arose within the KA03 "Support of intersectoral mobility" publications were created containing papers from these events (workshops and professional discussion forums). These publications were within the project funding printed with the registered ISBN number and their electronic version was stored in the communications portal of the project "Nanoteam VŠB - TU Ostrava" – see http://nanoteam.vsb.cz.

3.3 Events organised by the project partner - COMTES FHT a.s. – KA03

Seminar entitled "Ultra-fine grained structures in metallic materials"

Project partner – the company COMTES FHT a.s. – organised at the premises of the VŠB – TU Ostrava on 22nd October 2013 the seminar dealing with the topic "Ultra-fine grained structures in metallic materials".

The presented papers dealt with methods of preparation of UFG materials and with evaluation of changes of material properties. The seminar was attended and supported by 20 academic staff and 60 students from the VŠB –TU Ostrava. Each supported participant of the seminar received the Certificate of participation.

Seminar entitled "Applied research and development in the field of ultra-fine grained materials"

Project partner organised on 18th April 2012 the seminar "Applied research and development in the field of ultra-fine grained materials" at the ZČU in Plzeň, where 19 academic staff and 17 students from the ZČU Plzeň were supported. Each supported participant of the seminar received the Certificate of participation.

During 23rd – 24th November 2012 the second seminar "Applied research and development in the field of ultra-fine grained materials" took place in Dobřany at the residence of the company COMTES FHT a.s. At this seminar altogether 6 academic staff and 38 students from the VŠB-TUO and ZČU were supported. Each supported participant of the seminar received the Certificate of participation.

COMAT 2012 (http://www.comat.cz/cz/) – detachment of special sections for the project "Nanoteam VŠB – TU Ostrava"

 2^{nd} International Conference on Recent Trends in Structural Materials (COMAT 2012), which took place from $21^{st} - 22^{nd}$ November 2012 was focused on the topic "Advanced trends in structural materials".

The project "Creation of an international team and participation in scientific networks and in the field of nano-technologies and unconventional forming of materials " was promoted within this international conference organised by the project partners COMTES FHT a.s. and TANGER spol. s.r.o in collaboration with the ČSNMT. At this conference two independent sections were detached for the needs of the Nanoteam VŠB – TU Ostrava. Chief manager of the project, Professor. Ing. Stanislav Rusz, CSc., and subject manager of the project, Ing. Jan Kedroň at the very beginning of this event presented to the seminar participants the project "Nanoteam VŠB – TU Ostrava", its main objectives, operation of the project, achievements to this date and collaborating organisations. Ing. Michal Zemko, Ph.D. and professor Ing. Jozef Zrník, CSc. then read their papers within presentation of collaborating organisations, and mainly the project partner COMTES FHT a.s.

The first section was conceived as presentation o professional papers dealing with nanostructural materials and unconventional methods of forming. The second section was conceived as discussion panel focused on aspects of preparation of international research project, possibilities of participation in the project and transfer of information on the project to the target group. Within this section altogether 10 academic staff and 48 students from the VŠB – TUO and ZČU Plzeň were supported, and they received the Certificate of participation. Within project promotion its logos, logo-links, registration numbers, etc. were published in printed and electronic version of the conference program.

Ing. Jan Kedroň presents the project "Nanoteam VSB – TU Ostrava" at the conference COMAT 2012

3.4 Active participation on international conferences – KA03

Bulk Nanostructured materials 2011

Conference "BNM 2011", which took place from 23rd – 26th September 2011 in Ufa, Russia. Presentation of the paper: Influence of Heat Treatment to Achieve Refining Structure of Low Carbon Steel with use DRECE Process.

TNT 2011: Trends in NanoTechnology

Conference "TNT 2011" took place from 21st – 25th November 2011 in Spain. Presentation of the paper: Change of geometry of ECAP channel to increase deformation intensity by SPD process AlMn1Cu alloy.

TMS 2012: Linking Science and Technology for Global Solutions

Conference "TMS 2012" took place from 11th – 15th March 2012 in Orlando, USA. Presentation of the paper: Combination of DRECE Process and Heat Treatment to Achieve Refining Structure of Brass.

19th International Scientific and Technical Conference KONTECH, entitled: Advanced forming technologies and nanostructured materials

Conference "KONTECH 2012" took place from 6th – 9th MAy 2012 in Opalenica/Poznaň, Poland. Presentation of the paper: Refining structure of brass by DRECE process.

22. International Email Kongresses

22nd International Congress on Enamelling took place from 3rd – 7th June 2012 Cologne, Germany. Presentation of the paper: An Effect of Clay Particles Size on Functional Features of Vitreous Enamel Coatings.

The 13th International Conference on Aluminium Alloys

Conference "ICAA13" took place from 3rd – 7th June 2012 in Pittsburgh, Pennsylvania, USA at the Carnegie Mellon University. Presentation of the paper: Structural Evolution in Aluminium Alloy AA6082 During HPT Deformation at increased temperature.

JUNIOR EUROMAT 2012 – The Federation of European Materials Societes

Conference Junior Euromat took place from 23rd – 27th July 2012 in Lausanne, Switzerland. Presentation of the papers: DRECE machinery – new construction design of die for production UFG materials, Influence of changes deformation on Structure ALMn1Cu alloy with use SPD process, Simulation of Extrusion process of Al alloys tool ECAP with modified geometry and comparing with experiments

16th International Research / Expert Conference "Tredns In The Devolepment Of Machinery and Associated Technology"

Conference "TMT 2012" took place from 10th – 12th September 2012 in Dubai, UAE. Presentation of the papers: Structure of AZ31 Magnesium Alloy After ECAP Processing, Structure and Mechanical Properties Selected Magnesium – Zirconium Alloys.

The 12th International Nanotechnology Exhibition and Conference

The conference and specialised trade fair "NanoTech 2013" took place from 30th January – 1st February 2013 in Tokyo, Japan.

TMS 2013: Linking Science and Technology for Global Solutions

Conference "TMS 2013" took place from 3rd – 7th March 2013 in San Antonio, Texas, USA. Presentation of the papers: Optimisation of the Process for Obtaining an UFG Structure in WE43 Alloy, Optimisation of the Process for Obtaining an UFG Structure in Mg Alloys.

8th Pacific Rim International Congress on Advanced Materials and Processing

Conference "PRICM8" took place from 4th – 9th August 2013 in Waikoloa Village, Waikoloa, USA. Presentation of the paper: Combination of ECAP Process and Heat Treatment to Achieve Refining Structure of Selected Magnesium Alloys.

Information on these conferences, which took place within the project "Nanoteam VSB – TU Ostrava", are published in KA03 – Support of inter-sectoral mobility of the Nanoteam VSB – TU Ostrava, Conferences abroad (ISBN 978-80-248-3418-4).

3.5 Short-term internships abroad – KA03

University Münster, Germany

From 14th – 17th August 2012 we visited University in Münster, Germany. The purpose of the visit was to get acquainted with the experience of researchers from the University of Münster, Institute of Material Physics, and with their existing involvement in major European projects. The University of Münster was represented at the meeting by Prof. Gerhard Wilde, Prof. Sergey Divinsky, Dr. Harald Rösner. From our part the following supported specialists took part at this meeting: Prof. Rusz Stanislav, Ing. Kedroň Jan, Ing. Stanislav Tylšar – representing VŠB-TU Ostrava, and Ing. Libor Kraus, Ing. Michal Zemko, Ph.D. – representing our co-investigator, i.e. the company COMTES FHT, a.s.

Institute metallurgy and material sciences, Polish Academy of Sciences in Cracow, Poland

On 19th April 2012 Prof. Ing. Stanislav Rusz, CSc. doc and. RNDr. Lubomir Cizek, CSc. visited the Polish Academy of Sciences in Cracow. Our Polish partner was represented by Prof. Jan Dutkiewicz, Prof. Jerzy Morgiel and Dr. Wojciech Maziarz. In the Institute PAV in Cracow the project CZ.1.07/2.3.00/20.0038 "NANOTEAM VSB-TU Ostrava" was presented to other interested scientists and researchers. We also consulted the issues connected with the preparation and orientation of the target project as a follow-up to discussion held at the workshop (from 2nd to 4th February 2012) in Trojanovice.

OML – Institute of non-ferrous metals, Branch for light metals, Skawina, Poland

From 10th to 12th May 2012 we visited the company OML Skawina near Cracow, which is branch of the Institute of non-ferrous metals (Instytut Metali Niezelaznych = IMN) in Gliwice. This Research Institute is a leading manufacturer of non-ferrous alloys based on AI and Mg. It has modern technical equipment enabling the production of ultra-fine grained metallic materials and it is potential and very important future partner for the Nanoteam VSB-TU Ostrava. The meeting was attended by representatives of the Polish side - Professor Jan Dutkiewicz, Dr. inż. Bartłomiej Płonka, Dr. inż. Andrzej Kłyszewski, Mgr. inż. Boguslaw Augustyn, Mgr. inż. Piotr Korczak and Mgr. inż. Krzysztof Remsak. Within the professional seminar we presented the project CZ.1.07/2.3.00/20.0038 "Nanoteam VSB-TU Ostrava." Afterwards we had intensive consultations related to the participation of the company OML Skawina in the target project.

Technical University in Czestochowa, Poland

On 14th June 2012 the specialist involved in the project "Nanoteam VŠB - TU Ostrava" - RNDr. Lubomir Cizek, visited the Technical University in Czestochowa. Within the frame of this visit he consulted the issues related with fulfilment of the project tasks and discussed the content of professional scientific collaboration with Prof. Dyja and dr. Krapiński.

Silesian Technical University in Katowice, Poland

From 19th to 20th September 2012 Prof. Ing. Stanislav Rusz, CSc. and doc. RNDr. Lubomir Cizek, CSc. visited the Silesian Technical University in Katowice. The meeting was attended from the Polish side by Prof. Hadasik, Prof. Hernas, Dr. Kielbus, and Dr. Kuc. At the meeting we made a presentation of our project CZ.1.07/2.3.00/20.0038 for other interested scientists and researchers. Afterwards we consulted the issues connected with the preparation and orientation of the target project as a follow-up to discussion held at the workshop in Trojanovice.

Institute of Metallurgy and Material Sciences, Polish Academy of Sciences, Cracow, Poland

During 15th – 17th November 2012 we visited the Institute of the Polish Academy of Sciences in Cracow. The meeting was attended from the Polish side by Prof. Jan Dutkiewicz, Prof. Jerzy Morgiel, Dr. Wojciech Maziarz, Prof. Jozef Zasadzinki, Vice-Dean Dr. Waclaw Muzykiewicz, and on behalf of INOP Poznan - Prof. Hanna Wisniewska Weinert, on behalf of Institute of Non-Ferrous Metals - OML Skawina - Prof. Andrzej Klyszewski, on behalf of Explomet - Dr. Zygmunt Szulc. At the meeting we presented our project CZ.1.07/2.3.00/20.0038 to other interested scientists and researchers. Afterwards we consulted the issues connected with the future orientation of the project.

Silesian Technical University in Katowice, Poland

During the 30th and 31st January 2013 we visited for the second time Silesian Technical University in Katowice. The aim of this meeting was to discuss the technical orientation of the project and the findings gathered from professional discussion forums held in Ostravice, Hukvaldy and from the workshop in Trojanovice. During this two-day meeting we visited also the research laboratories and discussed research projects, utilisation of their instrumentation for the production of materials with UFG and nano-structure, as well as the possibility of preparing a joint project of VŠB - TU Ostrava and the Silesian Technical University in Katowice. The meeting was attended by Prof. Ing. Stanislav Rusz, CSc., Doc. RNDr. Lubomir Cizek, CSc., Prof. Eugeniusz Hadasik, Prof. Adam Hernas, Prof. Sozańska, Dr. Kuc, and Dr.Tkocz.

Technical University in Czestochowa, Poland

During 5th to 7th June 2013 we visited the Technical University in Czestochowa, Poland. The purpose of this short-term stay was to exchange experience with the management of European projects and discuss the opportunities for cooperation, and for filing a joint project. Within the frame of this stay we visited also the laboratories of the whole Faculty of processing and material engineering, in which we were acquainted with the research possibilities of the Institute from the viewpoint of preparation of the content of the future research project in the field of application of UFG materials in industrial practice. On behalf of the VSB - TUO the following specialists participated in this business trip: Prof. Stanislav Rusz , CSc. , Ing. Kedroň Jan, Ing. Tylšar Stanislav and Ing. Michal Salajka . We gradually met the following experts from the Technical University in Czestochowa: Prof. Dr.hab. inż. Henryk Dyja, Dr.hab. inż. Marcin Knapiński, Prof. PCz., Dr.Inż. Marcin Kwapisz, Dr.hab. Anna Kawalek, Prof. PCz. , Dr.Inż. Szymon Berski, Dr.Inż. Sylwester Sawicki, Dr.Inż Paweł Wieczorek.

Institute of Chemistry And Materials Science in Paris, France

From 27th to 30th June 2013 we made a short-term visit to the cooperating organization - EAST PARIS INSTITUTE OF CHEMISTRY AND MATERIALS SCIENCE. The purpose of the visit was to map the possibilities of cooperation at preparation of the future project, mutual exchange of experience with building of international teams and with and participation in

international projects. The VSB-TUO was represented by Prof. Stanislav Rusz, CSc., Ing. Kedroň Jan, Ing. Tylšar Stanislav, Ing. Michal Salajka, the company COMTES FHT was represented by the following supported specialists - Ing. Libor Kraus, doc. Ing. Jan Džugan, Ph.D., Ing. Martina Boehmová. The Institute of Chemistry And Materials Science (Institut de Chimie et des Matériaux de Paris Est) was represented by Dr. Yannick Champion, Dr. Patrick Ochin, Prof. Ivan Guillot and Prof. Leo Mazerolles.

At this meeting there we presented the results of our project achieved so far. We also consulted the issues connected with the preparation and orientation of the target project as a follow-to the discussion held at the workshop in Kopřivnice. We discussed in detail the issues related to new research directions in the field of technologies for production of UFG materials. We also discussed the problems of preparation of the project strategy from the perspective of possibilities of their Institute. We were also shown their laboratories so that we can judge possible use of their equipment at solution of the tasks of the target project.

University of Žilina, Slovakia

On 17th July 2013 Prof. Stanislav Rusz, CSc. and Doc. Lubomir Cizek, CSc. visited the University of Žilina. Our Slovak partner represented by Doc. Donič and Dr. Baštovanský. The meeting was focused on deepening of our cooperation at solution of the first key activity (courses & strategy) of the project "Nanoteam VSB-TU Ostrava," and on preparation and organisation of professional content of the ODF 3 (2013) and of the 3rd Workshop (2014). During this visit, the above issues were discussed with Prof. J. Dutkiewicz (guest of the University of Žilina). We also established contact with Prof. Christan Codd, Université de Technologie Belfort-Montbéliard (guest of the University of Žilina), who informed us about his experience with cooperation within the EU projects and about the possibility of participation in other planned events of the "Nanoteam VSB-TU Ostrava."

University of Žilina, Slovakia

In accordance with the plan we paid a short-term visit from 13th to 15th March 2014 to the University of Žilina. The "Nanoteam VŠB - TU Ostrava" was represented by Prof. Ing. Stanislav Rusz, CSc., Ing. Jan Kedroň, Ing. Stanislav Tylšar and Ing. Michal Salajka. The University of Žilina was represented by Doc. Ing. Tibor Donič, CSc., Ing. Milan Martikán, Ph. D., and Ing. Andrea Soviarová.

We also discussed the future and strategy of the project "Nanoteam VSB-TU Ostrava," and possible further cooperation between the two universities. The visit at the University of Žilina comprised also a tour of laboratories and examination of the laboratory equipment of the Department of Applied Mechanics.


Institute of Metallurgy and Material Sciences, Polish Academy of Sciences, Cracow, Poland

From 3rd to 5th April 2014 we paid a short-term visit to the Polish Academy of Sciences in Cracow. The project "Nanoteam VŠB - TU Ostrava" was represented by Prof. Ing. Stanislav Rusz, Csc., Ing. Jan Kedroň, Ing. Stanislav Tylšar and Ing. Michal Salajka. PAV Cracow was represented by Prof. Jan Dutkiewicz, P. Wojciech Maziarz, Prof. Jerzy Morgiel, Prof. Lidia Litynski and Dr. Lukasz Rogal.

The discussed topics included the strategy for future cooperation, possibilities of filing other joint projects, and also participation in the projects Erasmus and Marie Sklodowska Curie. We also visited the laboratories of the Institute of Metallurgy and Materials Sciences and were acquainted equipment and operation of their new facilities.

Information on the progress of the short-term visits abroad, which were carried out within the project "Nanoteam VŠB - TU Ostrava," were published in KA03 - Support of intersectoral mobility of the Nanoteam VŠB - TU Ostrava, Short-term visits abroad (ISBN 978-80-248-3417-7).

3.6 Creation of the communication platform of the Nanoteam – KA04

Under the key activity we created the communication system for education as a functional web portal of the required style, which serves as a virtual university with sections focused on learning and information exchange. It serves also as a library and educational centre of the scientific team. The objective of the communication portal is also provision of information about members of the scientific team, where they can offer to their colleagues more detailed information about their work, their experiences and agree sharing of their experiences. Our foreign partners assessed this portal at the 3rd workshop very positively with the possibility of their participation and self-presentation. Special section dedicated to the currently solved problems by the teams of VSB-TUO and Comtes FHT a.s., as well as information about current needs for future projects, is very important component of this portal.

We created several user groups, according to positions, with the possibility of discussion in a closed group of registered members. A discussion forum on various topics is also used for better communication. Each member of the communication portal received his own e-mail address with the authorisation and login into the system. Video-conferencing enables better communicate at a distance, and will thus make it possible to inter-connect the scientific team members from different countries, who will thus be made more easily available at any time. Finally, was also created the operating instructions for using the portal.





Graphic visualisation of functioning of communication of international team.

4. FUTURE AND CONTINUATION OF THE PROJECT "NANOTEAM VSB – TU OSTRAVA"

Within the sustainability of the project the generated outputs from the key activities will be included into education of students and of academic staff at the VŠB - TU Ostrava and they will be financed from our own sources. At the same time we will also ensure the continuation and deepening of the established cooperation with the project partners, both with foreign and domestic specialists.

The future and continuation of the project "Nanoteam VŠB - TU Ostrava" is ensured by using the created Nanoteam communication platform (http://nanoteam.vsb.cz). This communication system as a functional web portal is described in more detail in the Chapter 6.3. Publicity and maintaining of personal contacts is further ensured through the organisation of the Conference COMAT by the project partner and by individual visits of collaborating working sites.

Thanks to the cooperation established with our foreign partners from Germany, France, Poland and Slovakia, the possibility of involving the students into exchange programs (Erasmus Network, Visegrad Foundation), internships for students and PhD students and post-doctoral students is ensured, as well as their guiding at preparation of final theses.

5. FINAL EVALUATION OF THE PROJECT "NANOTEAM VSB – TU OSTRAVA"

The project "Creation of an international scientific team and participation in scientific networks in the field of nano-technologies and unconventional forming of materials" was launched on 1st June 2011 and concluded on 31st May 2014. The applicant and investigator of



the project was the VSB - Technical University of Ostrava, Faculty of Mechanical Engineering. The company COMTES FHT a.s., Dobrany was partner of this project.

During the period of solution lasting 36 months the close co-operation of the research team at the VŠB - TU Ostrava and partner company COMTES FHT a.s. resulted in creation of a partnership team, which succeeded during that period in establishment of cooperation with several major European research centres and universities, as well as with domestic industrial companies and universities. The main objective of the project was to create a professional team dealing with new findings in the area of development of ultra-fine grained materials to nanomaterials and their possible application in industrial practice. It appears very realistic that this team will be able to create a strong international partnerships and increase thus its success at filing of international projects dealing with the given topics.

Realisation of the project "Nanoteam VŠB - TU Ostrava" made it possible to establish very good cooperation with the University of Münster, Institut für Materialphysik and with Prof. Dr. Gerhard Wilde, a recognized expert in the topics of the physical nature of plastic deformation in nano-structural and UFG materials, phase equilibria and physical models of these materials.

Very important cooperation was established also with the Institut de Chimie et des Matériaux Paris-Est - CNRS-UPEC, with its Director of Research Dr. Yannick Champion and with Dr. Loïc Perrier, Head of the Department of metallurgical processing. Professional specialisation of both these collaborators of the project is aimed at UFG materials, chemical metallurgy, including metal processing, structural characterisation and mechanical properties.

We also deepened our close cooperation with the Institute of Metallurgy and Materials Science, Polish Academy of Science, with Prof. Dr.hab. Inz. Jan Dutkiewicz and Dr.hab Inz. Wojciech Maziarz, Prof. PAN (highly respected researchers in the area of analyses of various types of materials by TEM and SEM microscopy), as well as with the Czestochowa University of Technology, Prof. Dr. hab. Inż. Henry Dyja, Dr.h.c. and Prof. PCz, Dr. hab. Inż. Marcin Knapinski (highly respected professionals in the field of forming of materials and in the simulation of forming processes on plastometre GLEEBLE), with the Silesian University of Technology - Politechnika Slaska, with Prof. Eugeniusz Hadasik (a specialist in the production, analysis and mathematical simulation of magnesium alloys with UFG and nano- structure), with the University of Žilina, with doc. Ing. Tibor Donic, CSc. , (renowned researcher and educator, specialised on the production of UFG metallic materials and special materials - exemplary Al alloys with the addition of rare earth metals; he has a laboratory equipment that is unique in the whole Europe using the principle of ECAP combined with back pressure and ultrasound), with the Charles University, with Prof. RNDr. Pavel Lukac, DrSc. - highly respected scientist in



the field of super-plastic forming of alloys made of non-ferrous metals, the essence of which is the initial UFG or nano- structure .

These topics of scientific and research activities of the Nanoteam VŠB - TU Ostrava were presented and discussed with industrial companies and with research organisations involved in the implementation of UFG metallic materials into practice. The following companies and experts were involved in the project "Nanoteam VŠB - TU Ostrava": SVÚM a.s., Ing . Vladivoj Očenášek , CSc.; Technology Park Chomutov o.p.s. , Ing . Josef Hassmann , CSc. and Ing . Miroslav Krtička, Ph.D.; VÚHŽ a.s., Ing .Karel Malaník, CSc.; Materials and metallurgical research s.r.o. , Ing . Josef Bořuta, CSC. and HVCC s.r.o., Ing . Marcel Klos, Ph.D. Within the future collaboration with these partners we have agreed the possibility of participation at the preparation and solution of the projects focused on the research and development of UFG materials and SPD methods. What concerns the target group of the VŠB - TU Ostrava students, we have agreed a cooperation with the above mentioned companies concerning guiding of students within the BP, DP and internship for students of doctoral study programs. Thanks to these possibilities the target group of students will be able within the frame of the project to use the acquired skills and abilities in industrial practice and thereby increase their competitiveness on the labour market.