EUROPEAN VIRTUAL INSTITUTE ON
KNOWLEDGE-BASED MULTIFUNCTIONAL MATERIALS AISBL

KMM-VIN Newsletter

Issue 7, December 2012

In this Issue

EDITORIAL

We are presenting the seventh issue of the Newsletter of the European Virtual Institute on Knowledge-based Multifunctional Materials (KMM-VIN). The Newsletter is published twice a year, as Summer (in July) and Winter (in December) Issues.

KMM-VIN was established in 2007 as the main result of the Network of Excellence KMM-NoE (FP6 project). The legal status of KMM-VIN is Belgian international non-profit association (AISBL). KMM-VIN AISBL is registered in Brussels. It comprises now 69 members from 15 European States. It operates two offices: main office in Brussels and a remote one in Warsaw.

For its members KMM-VIN is providing an organizational framework to conduct jointly basic and applied research comprising materials processing, characterisation and modelling. For external clients KMM-VIN is offering integrated R&D, educational and innovation activities in the field of advanced structural and functional materials with main focus on Transport, Energy and Biomedical sectors.

The Winter Issue of the 2012 Newsletter contains usual columns as listed at the top, commencing as always with "Latest News". The most important part of each KMM-VIN Newsletter are the news from the Working Groups. Recently the Working Groups have been reorganized. In the past they used to be focused on selected groups of advanced materials. Now they are oriented at selected industry sectors acknowledged as target sectors for KMM-VIN research: WG1. Materials for Transport**,** WG2. Materials for Energy, WG3. Biomaterials and WG4. Modelling (crosscutting group).

In the column "KMM Projects" one can find information from European projects in which KMM-VIN and/or KMM-VIN members are involved. Special attention is given to two running FP7 projects coordinated by KMM-VIN: MATRANS ("Micro and Nanocrystalline Functionally Graded Materials for Transport Applications") and INNVIN ("Innovative materials solutions for Transport, Energy and Biomedical sectors by strengthening integration and enhancing research dynamics of KMM-VIN").

The column "Cooperation" contains updated information on KMM-VIN's activity in the European Technology Platform on Advanced Engineering Materials and Technologies (EuMaT) and in other European initiatives on Materials.

In the column "Research Fellowships and Trainings" information on the 5th Call of KMM-VIN Research Fellowships programme is given.

The list of KMM-VIN members (institutions) is given at the end of the Newsletter. For viewing the details of KMM-VIN members' profiles and information on current events the Readers are requested to visit our webpage www.kmm-vin.eu. The contact details to KMM-VIN Office can be found on the back cover of the Newsletter.

For research communities in Europe the upcoming year will be a year of getting ready to the next framework programme, Horizon 2020, which will be launched on 1st January 2014. The Horizon 2020 programme for research, development and innovation (R&D&I) is proposed to help Europe deal with the present and future challenges through supporting excellent science, technology and innovation.

Importantly, Horizon 2020 will combine different streams of the EU research and innovation funding into a single programme, embracing the current 7th Framework Programme (FP7), innovation activities from the Competitiveness and Innovation Framework Programme, and EU funding to the European Institute of Innovation and Technology (*see also* "Latest News").

Marek Janas, Editor

LATEST NEWS

PARTERSHIP

The number of KMM-VIN core and associate members is steadily growing. In December 2012 the partnership comprises 69 members, of which 65 are institutions (research centres, universities, industry and SMEs) and 4 are individual members.

PROMOTION

Modelling activities of the MATRANS (FP7) KMM-VIN project have been acknowledged in the EC Brochure "Modelling Materials". This brochure is about modelling of materials, their properties and behaviour as carried out in all FP7 Industrial Technologies NMP Materials projects. It can be downloaded from:
http://ec.europa.eu/research/industrial_technologies/modelling-materials_en.html

FORTHCOMING EVENTS

The 2013 General Assembly Annual Meeting of all KMM-VIN members will be held in Brussels on February 26-27, 2013. It will be a two-day meeting with Day 1 devoted to organizational issues and Day 2 focusing on research activities in the Working Groups and preparations to the KMM-VIN 1st Industrial Workshop to be organized in 2013.

MATRANS (FP7), a cooperative R&D project coordinated by KMM-VIN (see also "KMM Projects") will hold its final (M36) meeting on 21-22 Jan. 2013 at EADS facility in Ottobrunn n. Munich followed by Industrial Workshop (23rd Jan. 2013) to present project achievements to automotive and aerospace industry representatives.

BioMed 2013 (10th IASTED International Conference on Biomedical Engineering, www.iasted.org/conferences/home-791) sponsored by the International Association of Science and Technology for Development (IASTED) to be held on February 13-15, 2013 in Innsbruck, Austria is chaired by A.R. Boccaccini (FAU). Several other KMM-VIN teams are involved in organisation of the conference: E. Verne (POLITO) will be the organiser of the symposium "Biomedical and Coatings, Ch. Hellmich (TUW) – of the tutorial "Multiscale Mechanics of Bone and Bone Tissue Engineering"!

The final event of the **ISWA** FP7 CSA project ("Immersion in the Science Worlds through Arts") in which a number of KMM-VIN members are involved will take place in Grenoble on 21st February 2013 with participation of young artists – winners of the ISWA competition. For winners in individual art categories see http://www.iswaproject.eu).

The 5th (final) **iNTeg-Risk Conference 2013** "Risk Screening – Horizon 2020:From iNTeg-Risk to the E2R2 – European Emerging Risk Radar" will take place in Stuttgart, Germany on May 21-23, 2013. Further details about the conference can be found: http://integrisk.eu-vri.eu/filehandler.ashx?file=10719

INNVIN (FP7 CSA) project consortium will present the achievements and share the experience of year 1 of the project execution with other CSA projects funded by the Commission under the Call NMP.2011.4.0-5 Support to Networks of Excellence with durable integrated structures. The 5-CSA projects workshop will be held in Brussels on 1st March 2013.

KMM-VIN Advanced Course at CISM, Udine

A one-week KMM-VIN advanced course on "Skeletal tissue engineering mechanics, with links to biology, chemistry, and medicine" coordinated by Ch. Hellmich (TUW) and A. R. Boccaccini (FAU) has been postponed to 23-27 Sep. 2013.

Horizon 2020. The important message from the Commission one year ahead of the launch of Horizon 2020 is a need of consolidation of the European materials community. Some preliminary steps have been already undertaken: a common proposal for setting up a Knowledge and Innovation Community (KIC) for materials was jointly expressed by representatives of the European Technology Platform for Materials (EuMaT), the European Materials Research Society (EMRS), the Federation of European Materials Societies (FEMS), and the European Materials Forum (EMF). The Alliance for Materials (A4M) has been established as an important voice of the ETPs and the above materials societies. In July 2012, a workshop on Materials for the 2020 Challenges was organised by STOA Committee (Science and Technology Options Assessment) of the European Parliament jointly with EMRS, FEMS, EMF, and EuMaT.

It is to be noted that KMM-VIN is a part of these initiatives through its involvement in EuMaT, A4M and MatVal.

WHAT'S NEW IN WORKING GROUPS?

The internal research structure of KMM-VIN consists of the following Working Groups:

WG1. Materials for Transport
Coordinators:
P. Egizabal, Fundación Tecnalia, Donostia-San Sebastian
Th. Weissgärber Fraunhofer Institute for Manufacturing and Advanced Materials, Dresden

WG2. Materials for Energy
Coordinators:
M. Ferraris, Politecnico di Torino
Ch. Sommitsch, Graz University of Technology

WG3. Biomaterials
Coordinators:
A. R. Boccaccini, Friedrich-Alexander Universität Erlangen-Nürnberg
Ch. Hellmich, Technische Universität Wien

WG4. Modelling
Temporary coordinator: M. Basista, Institute of Fundamental Technological Research, Warsaw / KMM-VIN

NEWS FROM WG1: MATERIALS FOR TRANSPORT

1) WG1 structure and activity.

The discussion to define the structure and working methodology of WG1 has continued during the second semester of 2012. The proposal of the coordinators of creating four different subgroups that would encompass:

- ferrous alloys,
- non ferrous alloys,
- composite materials and
- other materials

has been accepted and each participant has been asked to send a short description of their competencies/interests/topics in the different sub-groups and state their own ideas on the following steps. Furthermore project proposals that could fit into the proposed scheme have been asked.

The structure of the WG is not yet completed and a coordinator for the subgroup related to other materials is still lacking but first collaboration proposals have been already collected. Up to now 4 different possible collaboration proposals have been received that would be based on the exchange of samples and information obtained through internal projects to the corresponding subgroup members that could subsequently contribute by applying their own knowledge in aspects related to modeling or characterization. So far the proposed projects deal with the development of magnesium based composite materials, joining technologies for dissimilar materials, Al_2O_3 reinforced intermetallics and the development and characterization of advanced cast steels.

2) Reference of a new European project related to knowledge based multifunctional materials

The Kick off meeting of EFEVE European project (Grant agreement no: 314582) was held on the 27 and 28th of November in the facilities of the coordinator, TECNALIA, in San Sebastian. This project was selected to be funded in the FoF. NMP.2012-7 call devoted to the topic of Innovative technologies for casting, material removing and forming processes and the consortium is composed of 6 SMEs, 6 large companies and 3 RTD institutions. The project is focused on the development of new nanoreinforced aluminium and magnesium alloys as well as new processes that may be suitable for such materials. Two different families of nanoreinforcements will be investigated. On the one hand the Russian institute MISIS will approach the development of nanodiamonds and other carbon based nanoreinforcements that may be incorporated into aluminium and magnesium alloys. TECNALIA and the French company MARION TECHNOLOGIES will focus on the problems related to the incorporation and agglomeration of nanooxides, nanocarbides and other nanometalic particles into the alloys. Another large part of the technical tasks will deal with the development of advanced high productivity manufacturing casting processes. Innovative production concepts will be applied to squeeze casting, low pressure and HPDC processes in order to develop new process variants that may offer higher productivity and quality ranges and to adapt them to the use of nanoreinforced materials.

Being a DEMO-type project the production of three final demonstrators belonging to the automotive, wind energy and constructions sectors is foreseen that should validate the work carried out in the RTD workpackages.

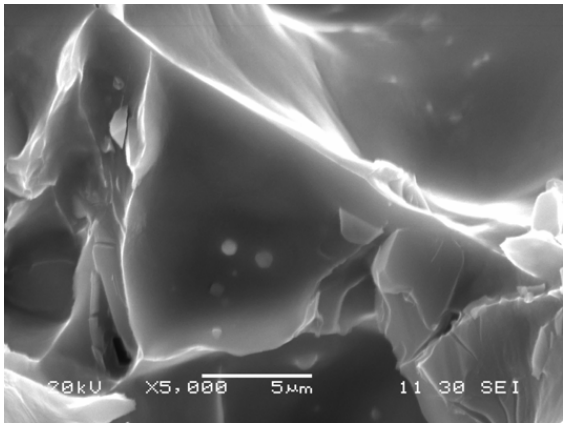

Fig.1. AZ91 Magnesium alloy reinforced with submicron sized TiC particulates produced by SHS (Self propagating high temperature synthesis) (Courtesy of TECNALIA).

3) Reference of a European project related to KMM materials

Fraunhofer IFAM Dresden co-operates with 7 partners from industry and research institutes within a FP7 research project "Siltrans". In the project started in October 2009 a new class of high temperature composites consisting of a continuous refractory metal framework (Nb, Mo, W) embedded in a silicide matrix will be developed, whereas a continuous (percolating) porous skeletons of refractory metal (Nb, Mo, W) will be infiltrated with molten silicon or silicon based alloy using gas pressure infiltration (GPI). During GPI partial reactions between melt and refractory metal will take place, forming silicides predominantly in the vicinity of the surface of porous precursor, leaving less free silicon for formation of silicides inside the porous structure, thus making in situ FGMs (functionally graded materials) with gradually increasing metal content towards the core of composite. GPI will be controlled to allow only limited amounts of silicon to enter porous structure, but completely close surface pores. After withdrawal of the (partially) infiltrated refractory skeleton from the melt further sintering will be performed using hot isostatic pressing to reduce residual porosity in the core and to finalize the silicide - forming reaction (surface will be optionally sealed by chemical vapour deposition – CVD, if necessary). Final composites shall not contain any free silicon - all must be converted into silicides, whereas the metallic skeleton must still remain as percolating structure. In such composites the silicide matrix will provide excellent oxidation resistance at high temperatures (forming silica), while refractory metal reinforcements will be utilised for HT strength, ductility and creep resistance enhancement.

Presentation of Projects and Research Groups of WG1

Presentation of a newly accessed member Chemnitz University of Technology (TUC)

CHEMNITZ UNIVERSITY OF TECHNOLOGY

Chemnitz University of Technology (TUC) is a recognized and internationally renowned production engineering teaching and research institution. It is one of the most modern research-focused universities in Germany and can rely on a distinctive profile in teaching and research. The Chair of Welding Engineering, with its head Prof. Peter Mayr, is specialised in welding and joining engineering including welding and joining technologies, characterisation as well as mechanical testing. It is well experienced based on many national and international research projects in cooperation with the steel, material and welding industry as well as research partners in the energy and transport sector.

Joining technologies available at the institute include various arc welding processes from low heat input micro-plasma welding to high heat input submerged arc welding, laser beam welding, electric resistance welding, induction welding, ultrasonic welding to diffusion welding as well as mechanical joining technologies such as advanced clinching and riveting technologies.

The Chair of Welding is experienced in joining various materials such as steels, aluminium, magnesium, titanium and plastics as well as in producing dissimilar joints of these materials. Beside joining, experience in hardfacing using iron, nickel and cobalt based alloys with or without second phase particles (pseudo-alloys) is investigated.

Properties of joints can be directly characterised in the metallographic laboratory as well as in the mechanical testing laboratory including static and dynamic testing capabilities.

Within KMM-VIN, TUC can contribute to WG1 "Materials for Transport" providing profound knowledge of joining strategies for light-weight constructions including similar and dissimilar joints between metallic partners but also between metal and fibre reinforced plastic parts.

Within WG2 "Materials for Energy", TUC is actively involved in developing joining strategies for high temperature power plant components made of steel and nickel based alloys. In addition to the development of joining strategies, also the long-term service behavior of welded components including the evolution of damage and causes of failure are investigated

Th. Weissgärber (IFAM-DD)
P. Egizabal Luzuriaga (TECNALIA),
WG1 coordinators.

NEWS FROM WG2: MATERIALS FOR ENERGY

Energy Materials: Meeting the Challenge - technical conference and exhibition was held at Loughborough University, UK on 16th – 17th October 2012. Our Working Group Materials for Energy presented there a poster (Fig. 2).

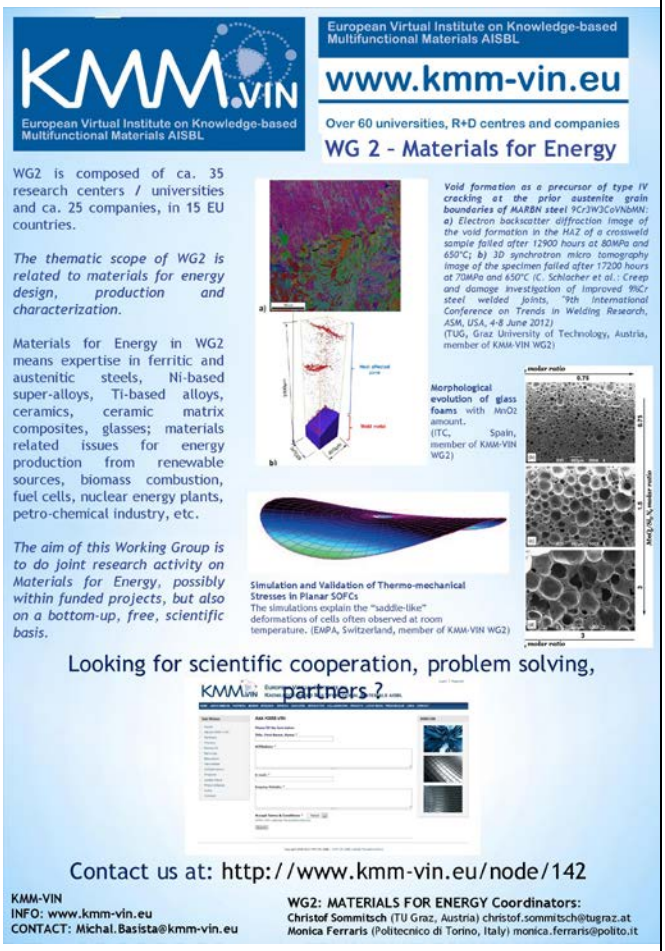

Fig. 2. A poster summarizing WG2 Materials for Energy scope and activities.

M. Ferraris, Politecnico di Torino
Ch. Sommitsch, Technische Universität Graz,
WG2 coordinators

Presentation of Projects and Research Groups of WG2

Correlative infrared-electron nanoscopy - a new method for resolving the interplay between local structure, conductivity and chemical composition *(Presented by CIDETEC)*

IK4-CIDETEC continues generating cutting-edge knowledge in the synthesis and physico-chemical characterization of metal oxide nanostructures as well as their integration in devices in the energy field. In particular, a Basque research team constituted by CIC NANOGUNE and IK4-CIDETEC presented recently a novel correlative infrared-electron nanoscopy technique and used ZnO nanowires as a high technological relevance application example. This innovative nanoimaging technique allows for a deeper understanding of the interplay between structure and conductivity in ZnO nanowires. The results, published in Nature Communications (http://www.nature.com/ncomms/journal/v3/n10/full/ncomms2118.html), open new avenues in the growth and device integration of ZnO nanowires. Until now, for example, the scientific community has focused on obtaining nanowires with diameters as thin as possible because it was considered they had more potentiality. However, IK4-CIDETEC/CIC NANOGUNE results suggest that lateral growth – a bigger diameter - is advantageous to obtain defect-free and high electronic conductivity material.

Improved creep resistant materials *(presented by TUG)*

An increase of the steam state in coal fired power plants to 700°C/350bar will increase the efficiency and decrease the CO2 emissions. Materials for these demanding conditions are austenitic steels such as Sanicro 25, HR3C or DMV310. The austenitic steel Sanicro 25 is one of the most promising austenitic steels for the application in superheater tubes. The high creep strength of this steel is mainly achieved by finely distributed Nb(C,N), Z-Phase and $M_{23}C_6$ precipitates. In the framework of the MACPLUS project, both experimental and numerical investigations on the evolution on these precipitates during aging at high temperature are carried out.

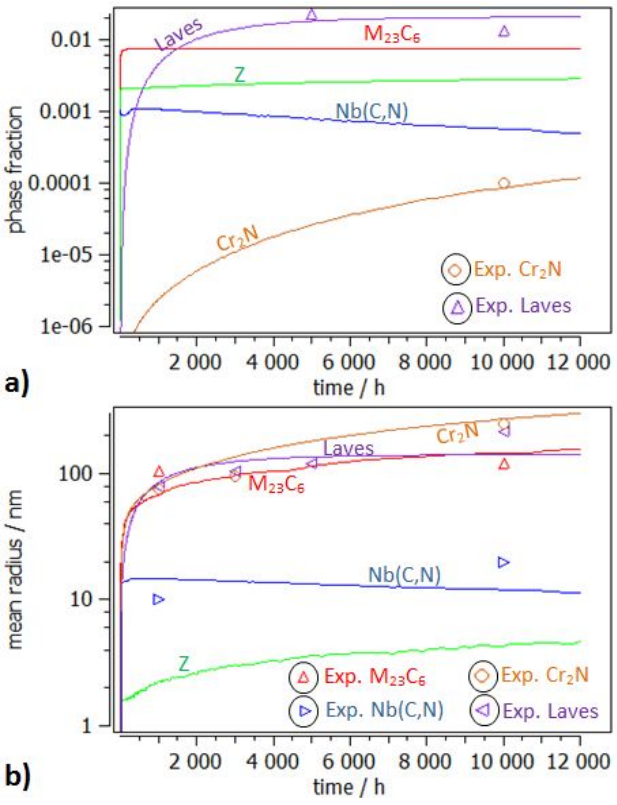

Fig.3. Experimental and calculated precipitates evolution in an advanced austenitic steel 22Cr25NiWCoCu (Sanicro25) during aging at 700°C for 10.000h. ***a)*** *Phase fraction evolution and* ***b)*** *Precipitates mean radii evolution. (Courtesy of TUG)*

Development of Heat Resistant Lightweight Material *(Presented by VGTU)*

Material with increased heat resistance for the reduction of heat loss of exploitable power boilers was created in pursuance of the EUREKA project E! 4487 **WASTEHEATCONCRETE** "TO DEVELOP HEAT RESISTANT AERATED CONCRETE AND ITS PRODUCTUION TECHNOLOGIES" (project duration 2008-2012).

This project was developed by Vilnius Gediminas Technical University (VGTU) in cooperation with foreign partners from Prydniprovs'ka State Academy of Civil Engineering and Architecture (Ukraine).

The main objective of this work was to ensure sufficient stability of the products, made on the basis of tobermorite, operating them in the temperature of 650˚C. An increasing crystallization degree of tobermorite and additionally reinforcing material with basalt fiber has been achieved (Fig. 4).

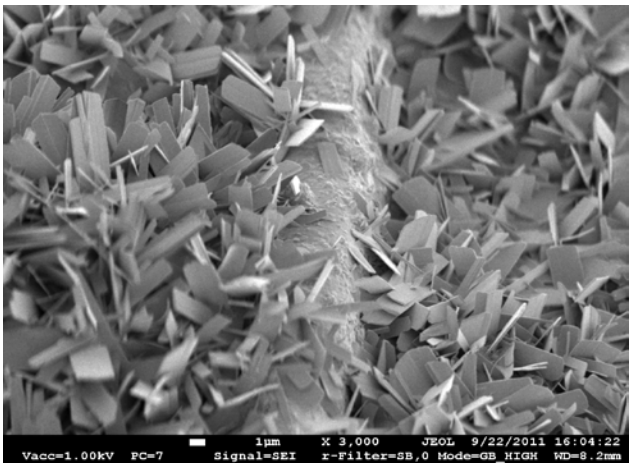

Fig. 4. Basalt fiber in the matrix of autoclaved aerated concrete (*courtesy of VGTU*).

Basalt fiber, which is resistant to temperature of 700˚C, was selected during this scientific research. It was fixed that basalt fiber not only partially corrodes in the alkaline environment but also puts forth a protective coating of calcium hydrosilicates and coalesces with the matrix of autoclaved aerated concrete thereby ensuring stable reinforcement of partition walls between pores.

Material with increased strength properties, which make it thermally stable at the temperature of 650^{o}C, was obtained.

Slovak University of Technology in Bratislava, Faculty of Materials Science and Technology in Trnava, Institute of Materials Science

Slovak University of Technology (SUT) is a modern educational and scientific institution. Since its foundation in the year 1937 more than 125 000 students have graduated. In average 19 000 students study at the STU every year. The STU is the oldest and largest academic institution for technical education in Slovakia. The university consists of seven faculties positioned in Bratislava and Trnava: Faculty of Civil Engineering, Faculty of Mechanical Engineering, Faculty of Electrical Engineering and Information Technology, Faculty of Chemical and Food Technology, Faculty of Architecture, Faculty of Materials Science and Technology, Faculty of Informatics and Information Technologies. All faculties realise credit system compatible with the European credit transfer system (ECTS) enabling mutual mobility of students within European Union member countries. In the area of scientific and research activities the SUT successfully joins European Union programs.

The Institute of Materials Science belongs to Faculty of Materials Science and Technology. The research and expertise activities of the Institute are aimed at complex metallic alloys (CMA), lead-free solders, second generation high temperature superconductors (2G HTS), nickel-based alloys, tool material, powder metallurgy, steels for energy industries, weldability of steels, thermal treatments and surface modification of materials, crystallization of metals and alloys, grain boundary engineering, as well as polymer materials. At present, the Institute possesses 5 laboratories (Structural analysis, Thermal treatment and mechanical testing of materials, Physicochemical measurements and processes, Soldering, Thermo-physical processes and calculations) equipped with a number of modern experimental techniques. In areas of research and education, the Institute has established intensive cooperation with local and foreign partnership organisations and production companies.

Contact:
J. Janovec, Director of SUT (jozef.janovec@stuba.sk)
M. Pekarčíková (marcela.pekarcikova@stuba.sk)

NEWS FROM WG3: BIOMATERIALS

Following the note in the previous Newsletter, a questionnaire has been sent to all members of the group to gain information on the existing expertise and research interests in the field of WG3. The information will be used to create subgroups with overlapping or matching research interest which will be formed and consolidated before the next KMM-VIN GA in 2013.

Presentations of Projects and Research Groups of WG3

BIOBONE - new EU project in WG3 domain with participation of FAU researchers

A new Initial Training Network (ITN) funded by the EU has been awarded in the field of Bioceramics for Bone Repair (BIOBONE) to a consortium with participation of the Institute of Biomaterials, University of Erlangen-Nuremberg (FAU). The coordinating institution is Imperial College London (UK). The project coordinator is E. Saiz. The project has a 4 year duration. The project will offer

multidisciplinary research training for young researchers in the field of bioceramics, bioactive glasses and composites for bone repair, which includes the development of ZrO2-based materials for orthopedic applications, CaP and bioactive glass scaffolds for bone regeneration as well as composites and nanohybrids, in collaboration with industry and universities. The scientific goals are to develop advanced knowledge on a range of bioceramics, bioactive glasses, hybrids and composites focusing on i) new processing strategies, ii) biodegradation understanding and optimization, and iii) cell-material interactions. The multi-disciplinary characteristic is reflected in the constitution of the consortium, which includes six academic partners, from universities and research centres, and four industry partners, from six countries (UK, Germany, France, Spain, Belgium and Switzerland), all of them with outstanding expertise in bioceramics and/or bioactive glasses and composites.

The Institute of Biomaterials at FAU (A.R Boccaccini) will be mainly involved in the development of novel bioactive glass scaffolds with added functionalities and ion release capability for bone regeneration. The projects at our Institute involve the investigation of novel scaffold architectures and new surface functionalisation techniques. The focus will be on the processing methods for these scaffolds, the study of the mechanical properties, degradation behaviour and cell-material interactions, which will lead to a new family of bioactive glasses with advanced functionalities for bone tissue engineering.

New research topics at IMIM

The structural changes of a mineral calcium carbonate with synthetized spider silk

The project aims at understanding the properties and internal structure of ceramic materials reinforced with synthesized spider silk. Envisaged research will consist of analysis of the microstructure of CaCO3 with the addition of spider silk, subjected to sintering at high temperatures (about 1000° C). Through the identification of such microstructure characteristics as the crystallographic orientation (texture) and residual stresses it will be possible to determine the properties of the new biomaterials. This project is in line with a widely developed in recent years research direction called biomimetics (bionics) aimed at the understanding of fundamental principles of design, technology and formation of shape developed by nature in the evolution process and then applying it to problems of human interest.

Self assembling surfaces for the blood contacting materials

Seeding of cells on functional, biocompatible scaffolds is a crucial step in achievement of desired engineered tissue. Future research of a dense cells culture will enable optimization of the scaffold shape. The proposed system can be applied for cell culture types used in biomedical engineering and advanced medicine.

Polymer tubes with modified inner surface towards blood cells biocompatibility will be one of the objectives of the research work. Porous coatings will be another objective and they will be fabricated by the "layer by layer" technique using electrostatic interactions. The technique will allow creating a multi-layer tissue-like structure. New blood contacting materials for a forced blood circulation are planned. The inner surface of the tube like devices will be covered with anti-thrombogenic coatings. Silicon carbide, silicon oxide, silicon nitride based materials will be used for deposition. Depending on the topography of the vessel inner surface and the chemical nature of non-thrombogenic bio-surface, termed neointima will be formed. Several approaches will be studied such as: archetype human vessel, design of a nanostructural artificial substitute, design of optimized surface by vacuum coating techniques, multiscale characterisation of materials, biomedical engineering, blood material interaction study in dynamic conditions at arterial flow environment. Surface functionalisation using endotherial cell are planned to be studied. Influence of non-biological materials with biomimetic coatings on the blood flow will also be studied.

Contact: B. Major, research group leader (nmmajor@imim-pan.krakow.pl)

News from TUW

A topical issue on mechanical characterization and modelling of tissues and biomedical materials across different length scales, has been recently completed. It will appear early 2013 in the journal Computer Modelling in Engineering & Sciences (CMES).

This is a late "product" of the biomaterials path that A. Boccaccini initiated for the EUROMAT 2011 conference.

Also, three KMM-VIN partners (TUW-UNIVPM-WUT) have applied for a "follow-up" SME project to our former project BIO-CT-EXPLOIT, called BIO-CT-VALIDATE.

New research topics at IK4-CIDETEC

Supramolecular Hydrogels with Self-healing Properties

IK4-CIDETEC has recently developed a new kind of supramolecular hydrogels with self-healing properties. These materials can be broken into pieces and after putting them together in a matter of seconds with complete recovery of their original mechanical properties.

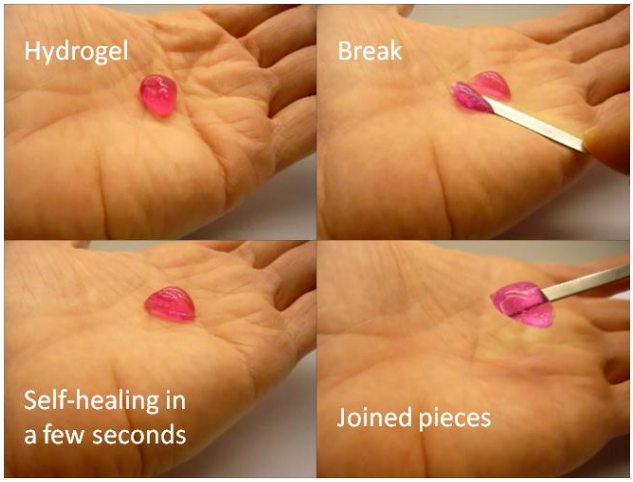

Fig. 5. Self-healing of supramolecular hydrogel (Courtesy of IK4-CIDETEC)

Hydrogels are hydrophilic networks that can absorb large amounts of water or biological fluids. Due to the hydrophilic nature and the presence of cross-linker, the network swells instead of dissolving, forming a gelatinous soft matter. Their great resemblance with living tissue and their gelatinous nature makes them a very interesting soft material for a wide range of biomedical applications, from tissue engineering to drug delivery.

The Biomaterials group at IK4-CIDETEC has developed a new family of supramolecular hydrogels, known as metallophilic hydrogels, based on coinage metal(I) thiolates (Au, Ag and Cu) which self-assemble through metallophilic attractions to form supramolecular architectures capable of absorbing water. This system has been employed to generate metallophilic hydrogels from peptides, drugs and macromolecules. The latest metallophilic hydrogels, prepared by IK4-CIDETEC, have shown unexpected but fascinating self-healing behavior. Conventional covalently-cross-linked gels are irreversibly damaged when cut in pieces. However, hydrogels developed by IK4-CIDETEC can self-heal in a matter of seconds after joining the broken pieces. This cycle of breaking/healing can be repeated without observing any loss in the hydrogel original properties.

Preliminary cytotoxicity studies have demonstrated the biocompatibility of this self-healing hydrogels with HELA cells. Such results suggest that this new family of hydrogels could have great applications for medical devices or injectable scaffolds for tissue engineering. For example, supramolecular hydrogels could be injected as cartilage or bone replacement allowing minimal invasive procedure for the patient

Presentation of a new research group from UH in the WG3 domain

University of Hertfordshire (UH), School of Engineering and Technology, Nanoparticles functionality research team led by Guogang Ren (g.g.ren@herts.ac.uk) proposes the following research topics to WG3:

1. Nanoparticles perfect dispersibility in engineered fluids and their surface treatments for florescence and eliminability in life science and biomedical applications.
2. Functionality and toxicity of metal/metal oxide nanoparticles for sensibility on pathogen and disease controls.
3. Florescent nanoparticles for sensors or indicators as drug delivery carriers or tracers for passing through the blood-brain barrier- properties and characterisations of gold nanoparticles and carbon nanotubes.

Research background of the research group leader

Guogang Ren's research work covers nano materials and composites, as well as engineered functional nanoparticles for energy, environmental protection and biomedical applications.

His research experience includes cross-disciplinary areas in materials chemistry and bio-medical materials engineering. His main research focus concerns the development of antiviral and antibacterial nanoparticles (AVNP). This also includes the use of these AVNP to dope bulk materials.

During the last 6 years, Ren's published over 25 papers in peer-reviewed journals in the areas of biomedical and biomaterials, has jointly written one book chapter and 3 patents on anti-viral and antibacterial nanoparticles (AVNP).

Together with J. Oxford (Queen Mary University of London), they were the first to initiate AVNP research in the UK. The research generated three AVNP patents with huge application interests from the biomedical and healthcare industries. A continuation of their AVNP research was centered at understanding the toxicities of antiviral nano-particles.

Ren's work also extended to a number of areas concerning medical devices and antibacterial dental materials. His other work covered medical-grade Sheet Moulding Compounds (SMC, with BRE and Menzolit Group Co.) for hospital facilities, antiviral aircraft filter fabrics (QinetiQ and Pall Aerospace), antiviral robber gloves, printing-coating films/inks (QinetiQ and Sun Chemicals), and aviation gas turbine lubricants (with QinetiQ Fuel & Lubricants).

Ren's current research interests in nanoparticles include: (i) the complete dispersion, dispersal modelling and simulation in fluidic media such as water, oil and gas based fluids, aiming to form uniform hydro-gels, aerosols and (ii) the interaction of nanoparticles with bio-organisms.

A.R. Boccaccini (FAU) and Ch. Hellmich (TUW)
WG3 Coordinators

NEWS FROM WG4: MODELLING

WG4. Modelling (under construction) is a cross cutting working group of KMM-VIN designed to support the vertical working groups WG1. Materials for Transport, WG2. Materials for Energy and WG3. Biomaterials with a variety of models and simulations relating to materials design, materials properties and materials behaviour in structural elements under service conditions.

At present WG4 gathers 35 research groups with different expertise and research interests. These include i.a. atomistic approaches, continuum micromechanics and multiscale models, phenomenological analytical and numerical models.

Recently, the members of WG4 have been asked to present research proposals for a joint research programme of WG4. The analysis of these proposals will help the W4 coordinators[1] identify members with similar research interests - a prerequisite to form thematic subgroups of WG4.

M. Basista (IPPT / KMM-VIN)
WG4 coordinator ad interim

Presentations of Projects and Research Groups of WG4

Slovak University of Technology in Bratislava, Faculty of Materials Science and Technology in Trnava, Institute of Materials Science (SUT)

Slovak University of Technology (SUT) is a new associate new member of KMM-VIN. It is a modern educational and scientific institution in Slovakia briefly introduced in the Presentation of Projects and Research Groups of WG2. The Institute of Materials Science belongs to one of seven faculties of SUT - Faculty of Materials Science and Technology. The research and expertise activities of the Institute are aimed at complex metallic alloys (CMA), lead-free solders, second generation high temperature superconductors (2G HTS), nickel-based alloys, tool material, powder metallurgy, steels for energy industries, weldability of steels, thermal treatments and surface modification of materials, crystallization of metals and alloys, grain boundary engineering, as well as polymer materials.

Beside this the Institute is also focused on computational modelling based on both quantum chemistry (ab-initio) and thermodynamics of phase equilibria.

Currently, the Institute is involved into following projects: Accurate ab-initio calculation of the potential energy hypersurface of ozone for the theoretical molecular spectroscopy; Accurate calculations and predictions of properties of increasingly complex molecules; Chemical sputtering - Computational modelling of interactions in the carbon containing films exposed to molecular ions and hydrogen; Interactions in bio and nanosystems; Study of phase equilibria in advanced materials using aimed experiments and computational thermodynamics.

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POLIMI team is developing mechanical characterization of materials by inverse analyses. This includes selection of parameters to identify in constitutive models; design of experiments by sensitivity analyses; deterministic or stochastic approaches; model reductions to alleviate computational burden. Clearly this topic has meaningful links with the following topics where POLIMI is active as mentioned in Newsletter 6: Numerical methods, Damage and fracture mechanics.

The methodology has as common features the following stages in each application:

- choice of material constitutive models to be employed for overall structural analyses apt to assess safety margins possibly reduced by material deterioration or by other circumstances;
- selection of the parameters to identify in the material models and of experiments for their estimation;
- computational modelling for computer simulations of the selected experiments;
- sensitivity analyses intended to optimize the experiment as for parameter estimation accuracy;
- model reduction by “proper orthogonal decomposition” in order to make fast and economical the test simulations required by inverse analyses;
- selection and implementation of the algorithm apt to identify the sought parameters either by a deterministic approach (i.e. minimization of the “discrepancy” between experimental data and their counterparts computed as function of the parameters to estimate) or by a stochastic approach (e.g. by Kalman filters apt to quantify uncertainties of the estimates as consequences of experimental random errors).

Sometimes it may be practically useful to exploit the above sequence of operative stages also for “model updating”, namely to optimize the computational modelling of the structural behaviour under service or extreme loading.

Within the above methodology, the POLIMI team is tackling the research problems specified below. These issues exhibit practical utility and meaningful novelties in industrial contexts. Therefore, partners for research projects, in industries and industry-related institutions are searched for.

For details see column *Partner Search for Project Proposals*

[1] to be elected at the KMM-VIN GA annual meeting, 26th Feb. 2013, Brussels.

KMM PROJECTS

During the past six months KMM-VIN has continued, as coordinator or partner, execution of several FP7 projects: MATRANS, INNVIN, iNTeg-Risk, MUST and MatVal. These projects are essential for the KMM-VIN association as they generate revenues for KMM-VIN through the project overheads.

Also, there is a number of projects coordinated by KMM-VIN members with other members involved as partners without KMM-VIN being included in the consortia, e.g. ISWA, JOLIE, NAMABIO, GLaCERCo. Such projects, although they do not generate revenues for KMM-VIN, are important for the integration of KMM-VIN partnership.

MATRANS (FP7)
"**Micro and Nanocrystalline Functionally Graded Materials for Transport Applications**" – project coordinated by KMM-VIN (M. Basista) started 1 Feb. 2010, ends 31 Jan. 2013. The consortium consists of 10 Beneficiaries and 6 Special Clause third parties linked to KMM-VIN: IPPT, IMIM, ITME, TUD, UNIVPM, POLITO (all KMM-VIN core members). Among project Beneficiaries there are also 3 KMM-VIN members: CRF, FHG (IFAM-DD) and R-TECH. Project webpage: http://matrans.kmm-vin.eu. MATRANS aims at development of novel metal-ceramic functionally graded materials (FGMs) for aerospace and automotive applications in: (i) exhaust and propulsion systems (ii) power transmission systems, (iii) braking systems, with the main objective to enhance the mechanical properties of these materials. MATRANS deals with two groups of the graded bulk composites: alumina ceramics - copper and alumina ceramics - intermetallics. More details in "MATRANS Newsletter 2012" available at www.kmm-vin.eu under Projects/Matrans/Public-documents.

iNTeg-Risk (FP7)
"Early Recognition, Monitoring and Integrated Management of Emerging New Technologies Related Risks." A large 4.5 year project ending in Spring 2013, coordinated by KMM-VIN member - European Virtual Institute for Integrated Risk Management (A. Jovanovic). KMM-VIN grouping comprising IPPT, IMRSAS, IMIM, MCL is a project partner. Further KMM-VIN members (MERL and R-TECH) are also involved in the project beyond KMM-VIN grouping. The iNTeg-Risk project will hold its **5th Conference** "Risk Screening – Horizon 2020: From iNTeg-Risk to the E2R2 – European Emerging Risk Radar" on May 21-23, 2013 in Stuttgart.

INNVIN CSA (FP7) – **"Innovative materials solutions for Transport, Energy and Biomedical sectors by strengthening integration and enhancing research dynamics of KMM-VIN"**. Coordinator: KMM-VIN (M. Basista); started 1 Feb. 2012, duration 3 years. The INNVIN project is one of 5 CSA projects originating from the former 14 Networks of Excellence in G3 Materials Unit of NMP.

INNVIN involves KMM-VIN as the beneficiary and 21 of KMM-VIN members as third parties linked to KMM-VIN. The primary objective of INNVIN is to engage the large transnational partnership of KMM-VIN in the process of transforming it into an organization with a more effective strategy towards the industry, which should enhance KMM-VIN's financial viability.

A recent highlight of INNVIN activities are the visits of small technical teams composed of KMM-VIN members to industrial companies across EU to present KMM-VIN's research, services and educational offerings in order to solicit contracts for KMM-VIN members. A system of service fees approved by KMM-VIN GA a few years ago will be applied to such contracts as a means to strengthen KMM-VIN financial viability.

MatVal ("**Alliance for Materials – A value chain approach to materials research and innovation**"), a new CSA FP7 project with KMM-VIN as a partner in the consortium started its activities on 1st October 2012. MatVal involves six European Technology Platforms making up the Alliance for Materials (A4M), the large European materials societies EMRS and FEMS and KMM-VIN as a representative of former Networks of Excellence (FP6). The aim of the project is to find solutions how to boost research leading to innovation in the context of the whole value-chain (from raw material to innovative product).

NAMABIO "From nano to macro biomaterials (design, processing, characterization, modelling) and applications to stem cells regenerative and dental medicine". (COST Action MP1005: Materials, Physical and Nanosciences). The aim of NAMABIO action is to coordinate research efforts to obtain a real breakthrough in the area of regenerative medicine of bones and teeth. The project started in April 2011 and scheduled for 5 years. is coordinated by UNIVPM (F. Rustichelli) and involves nine KMM-VIN members (UNIVPM, TUW, FRAUNHOFER-IFAM, FAU, AGH-UST, IMIM, WUT, BioIRC, UH). The project covers processing of innovative biomaterials; chemical and physical and mechanical characterization; modelling of physical and mechanical properties; stem cell loading on biomaterials, implantation on animals, and histological and molecular evaluation; 3D structural characterisation of tissue engineered bones and teeth by X-ray synchrotron microtomography. Already two calls for applications for Short - Term Scientific Missions for NAMABIO were issued.

JOLIE (MATERA+) "**Joining of Lightweight alloys to advanced FGM mEtal-ceramics materials**". A MATERA project coordinated by POLITO (M. Ferraris) and involving three KMM-VIN members (POLITO, CRF, EMPA). The aim of the project is to obtain a new car brake-disk system by joining one or more wear-resistant ceramic composite inserts to a lightweight alloy-bulk material to obtain lighter components and to improve energy efficiency. It started in June 2011 for a duration of two years.

GlaCERCo – ITN (FP7-People) "**Glass and Ceramic Composites for High Technology Applications – Initial Training Network**". Project coordinated by POLITO (M. Ferraris) started 1 February 2011, for a duration of 4 years; www.glacerco.eu.
Among the 10 partners 5 are members of KMM-VIN (POLITO, FAU, UNIPAD, IPM, MERL). The project offers a multidisciplinary training in the field of new high-tech glass based materials (glasses, glass-ceramics, glass- and glass-ceramic composites and fibres) with special attention to applications in strategic fields such as medicine (bioactive glasses as bone replacement and drug delivery systems), telecommunications (glass devices for broad-band applications), photonics (glass based photonic sensors), clean energy (Solid Oxide Fuel Cells glass sealants), waste management (vitrification and re-use of wastes).

ISWA (FP7) http://www.iswaproject.eu
"Immersion in the Science Worlds through the Arts". A CSA project coordinated by UNIVPM (F. Rustichelli) started 1 March 2011 for a duration of two years. Among 16 participants from 15 countries are 4 KMM-VIN members: UNIVPM, IPPT, IMRSAS and TUW. The project is targeted at young people discovering the common characteristic of the creative process in arts and sciences. Examples of artistic events based on scientific issues are realized and displayed in several European cities. The final event of the ISWA project will take place on 21st February 2013 in Grenoble, with participation of young artists – winners of the ISWA competition that was closed in November 2012.

ESTEEM2 (FP7) - **European network for electron microscopy** "Enabling Science and Technology through European Electron Microscopy" **–** European project coordinated by CEMES Toulouse and University of Oxford started 1 October 2012. The project integrates renowned European electron microscopy laboratories in European Research Infrastructure, which enables users to access the most advanced electron microscopes in an integrated fashion. A. Czyrska-Filemonowicz (AGH-UST) is a member of the Governance Board and AGH Platform leader.

The project involves three main activities: Transnational Access, Coordination and Support as well as Research and Development. Transnational Access provides open access to the major microscopy centers equipped with state of the art equipment and expertise, to the widest possible range of scientists. Coordination and Support activities disseminate using Electron Microscopy to materials scientists, physicists and engineers across the EU facilitate the sharing of skills. A limited number of directed research activities aimed at further development of electron diffraction, imaging and spectroscopy, advanced 3D methods and time resolved experiments. One of the project members is the International Centre of Electron Microscopy for Materials Science at the AGH-UST (see: Presentations). Website: http://esteem2.eu

EFEVE (FP7, FoF) Collaborative Project targeted to a special group (such as SMEs): „Development of a new high performance material associated to a new technological Energetic, Flexible, Economical, Versatile and Ecological process to make super strong and lightweight components" started In November 2012 for 3.5 years, with funding of 4.9 M€. Coordinator: FUNDACION TECNALIA (see also: News from WG1),

COOPERATION

European Technology Platform on Advanced Engineering Materials and Technologies EuMaT

Since 2008 KMM-VIN has been providing the **EuMaT** Technology Platform with secretariat services. Also, M. Basista is serving as EuMaT Secretary General This contributes to KMM-VIN visibility in industrial and research communities in Europe.

KMM-VIN is represented in the Management Board of "**Alliance for Materials**" (**A4M**) – a cluster of 6 ETPs initiated by EuMaT and five other Technological Platforms which have materials in their Strategic Research Agenda: SusChem, Manufuture, FTC (TEXTILE), ESTEP, SMR. The goal of A4M is to develop, verify and implement effective coordination schemes of materials research across different sectors, in the frame of the EU research and innovation programmes.

KMM-VIN is a member in the consortium of the CSA FP7 project "Alliance for Materials – A value chain approach to materials research and innovation" (**MatVal**) submitted by the A4M and the European materials societies EMRS and FEMS. The project started 1st October 2012 for duration of 2 years. KMM-VIN role in MatVal is in developing strategies for boosting research.

KMM-VIN RESEARCH FELLOWSHIPS and TRAININGS

Call for Research Fellowships 2013

The KMM Mobility Programme awards Research Fellowships on competitive basis for PhD-students and early stage researchers from KMM-VIN member institutions to do research at other KMM-VIN member institutions.

The **5th Call** for KMM-VIN Research Fellowships will be opened right after the KMM-VIN General Assembly annual meeting 2013 (26-27 February 2013). The deadline for applications will be March 31, 2013.

This is to be recalled that joint publications of the fellowship holder and the host are expected as a result of the KMM-VIN fellowship within 9 months after the research stay completion.

KMM Summer Schools reactivated as CISM courses

A one-week advanced course "KMM-VIN – Skeletal Tissue Engineering Mechanics, with Links to Biology, Chemistry and Medicine" to be held at CISM (Udine, IT), originally scheduled for September 2012, has been postponed for September 23-27, 2013

The course coordinators are Ch. Hellmich (TUW) and A.R. Boccaccini (FAU) who serve also as coordinators of the KMM-VIN WG 3 Biomaterials. Other lecturers of this course will be: Kalpana Katti (USA), Vladimir Komlev (Russia), Damien Lacroix (Spain) and Laurence Vico (France).

Details at http://www.cism.it/courses/C1312/ and KMM-VIN website.

PARTNER SEARCH FOR PROJECT PROPOSALS

Politecnico di Milano (POLIMI) team involved in KMM-VIN is looking for partners for the following research projects related to modelling and specialized characterisation techniques:

(A) Novel experimental equipment and parameter identification procedures for structural diagnostic analyses in depth by "dilatometric tests" The practical engineering purposes pursued by the project concern two diverse technology fields:

(i) structural diagnosis of concrete dams possibly deteriorated by alkali-silica reactions, in order to compute the present safety margin with respect to collapse under heavy external actions;

(ii) mechanical characterization of geological formations or soil and rock layers to be crossed by boreholes for hydrocarbon extractions, in order to assess stability margins of the deep hole walls.

The expected advancements in project (ii) may be practically useful for oil and gas extractions. They concern generalization of constitutive models and relevant calibrations to two- or three-phases (solid-liquid-gas) geo-materials. Such topic is consistent with the purposes of the huge international research project 2013 – 2023 organized by the US National Academy of Engineering (NAE) to improve safety of offshore drilling and will be one of the issues of the conference "Grand Challenges Global Summit", London, March 2013.

(B) Diagnostic analysis of masonry structures and of concrete dams by flat-jacks and digital image correlation "full-field" measurements. Such method of "almost non-destructive" "in situ" tests and parameter identification has been recently elaborated in dam engineering. Extension to periodic masonry might represent advantages in civil engineering and for historical building restoration, also for assessments of local properties (bricks, mortar and interface) without specimen extractions.

(C) Identification of residual stresses and of parameters in fracture models by indenters with new shapes.
As a continuation of the research project on inverse analyses based on non-destructive tests by indentation, the following results have to be pursued now: (a) estimation of residual stress tensor using novel optimized "ad hoc" indenters; (b) identification of parameters governing fracture behaviour using novel optimized "double-bicircular" indenter shapes; (c) model calibration of anisotropic elastoplasticity, with "ad hoc" indenter shapes. Such indenters are not yet available on the market.

(D) Identifications of parameters in constitutive models apt to describe the mechanical behaviour of membranes, foils or laminates employed for food-containing boxes.
The experimental techniques at the basis of such inverse analysis procedures are, besides "full-field" measurements of displacements: cruciform biaxial tension tests; "sandwich experiments" with stabilizers for compression and bending tests on multi-layer laminates and/or on specimen containing creases for the production of food containers.

(E) Mechanical characterization of materials and biological tissues at small length scale.
Nanoindentation is a powerful technique which may be successfully applied to this purpose. Bone and cartilage tissues are paradigmatic examples of "materials" in which the characteristic length of its hierarchical structure and the probe size mutually interact, thus providing a fruitful investigation tool. The capability to run experiments in liquid environment, which can replicate the physiological conditions of the working environment of tissues, enables one to expand the investigation of the material response in the time domain where visco-elasticity and poro-elasticity may play relevant roles as dissipation mechanisms.

Small scale investigation of materials can also find a fertile area of research in the field of mechanical behaviour of micro-electronic devices in diverse engineering fields like power electronics or stretchable electronic devices. Research collaborations with foreign institutions and with industrial partners are currently on going and are allowing POLIMI to acquire significant expertise in the field. Collaborations on inverse analysis problems with other teams in the KMM-VIN framework might be highly productive.

The above listed topics on material characterizations by inverse analyses involve activities of several researchers of POLIMI.
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At present interactions and collaborations of POLIMI researchers occur with teams in many universities, as well as with Italian industries, e.g.: Venezia Tecnologie, Marghera (C); Tetrapak, Modena (D); ENI, San Donato, Milan (A); Breda, Cormano, Milan (C); RSE, Milan, and Italian Committee on Large Dams, Rome (A, B); ST Microlectronics (E).

The success of the above projects requires close interactions of practitioners in the industrial area, experimentalists and university researchers. Two years might represent a reasonable period to reach final conclusions on operative procedures and instrument realizations for applications with expected remarkable advantages (and benefits) with respect to the present engineering practice.

PRESENTATIONS

The International Centre of Electron Microscopy for Materials Science (IC-EM) at AGH-UST

The International Centre of Electron Microscopy for Materials Science (www.tem.agh.edu.pl) headed by Prof. Aleksandra Czyrska-Filemonowicz continues over 50 year long tradition of electron microscopy at the AGH University of Science and Technology in Kraków. The Centre was created on 1st June 2010 as the non-faculty unit, acting in co-operation with foreign partners. The lead unit of the Centre at the AGH-UST is the Faculty of Metals Engineering and Industrial Computer Science and the lead foreign partner is the Forschungszentrum Jülich in Germany.

The main activity of the IC-EM is the application and tuning of new methods of electron microscopy to materials investigations, mainly to quantitative characterization of the micro-and nanostructure of innovative materials in order to achieve the desired properties. The main groups of the materials

investigated at IC-EM are materials for energy systems, aeronautics, graded and multilayered materials, biomaterials, nanomaterials, structural and functional materials.

The IC-EM team comprises 10 permanent researchers, 1 (permanent) visiting professor, 2 technicians and several PhD students. Their field of expertise covers quantitative characterization of micro/nanostructure and properties of engineering materials, including structural defect analyses and phase identification in multiphase and multilayered materials down to the nanoscale (even atomic) scale by advanced electron microscopy, electron tomography and electron holography. The IC-EM staff is developing methods for nanophase identification and mapping by coupling fast EDX spectrometry and precession electron diffraction (PED) in the Cs-corrected STEM as well as STEM-EDX tomography.

The Centre has developed its infrastructure to upgrade the expertise in several advanced techniques. The IC-EM is equipped with 4 transmission electron microscopes (TEM) and 2 scanning electron microscopes (SEM). In particular, the third in the world ultimate performance analytical electron microscope, a Titan Cubed G2 60-300 for high resolution analytical microscopy at high (300 kV) and low (60 kV) energy of FEI was installed in 2011. This unique microscope is equipped with ChemiSTEM system consisting of the new X-FEG Schottky high brightness source with a monochromator, a high resolution STEM-HAADF unit with the new dodecapole DCOR probe Cs corrector and the new EDX microanalysis system based on the 4 windowless Silicon Drift Detectors (SDD) technology with enhanced acquisition efficiency (0.7 sr) and speed for low dose, high spatial (atomic) resolution and fast chemical mapping. The other unique equipment of the Titan Cubed G2 60-300 microscope includes EELS GIF Quantum 693 spectrometer for edge shifts/fine structure (using monochromator and probe Cs-corrector), new FEI PED precession electron diffraction, dual-axis tomography holder, Lorentz lens, rotatable biprism for off-axis electron holography and TARO for full remote access operation. Fig. 2 shows STEM-EDX elemental maps of CMSX-4 single crystal superalloy used for aero engine turbine blades acquired with Titan Cubed G2 60-300 with ChemiSTEM technology.

The second transmission electron microscope installed in 2011 is Tecnai G20 Twin with LaB6 cathode, equipped with DigiStar precession diffraction and ASTAR for orientation and phase mapping as well as STEM-HAADF and EDX microanalysis system (TIA/EDAX).

Other two TEMs – Jeol JEM-2010ARP and JEM-200CX - are the workhorse microscopes for defect analysis and intermediate resolution phase identification for engineering materials.

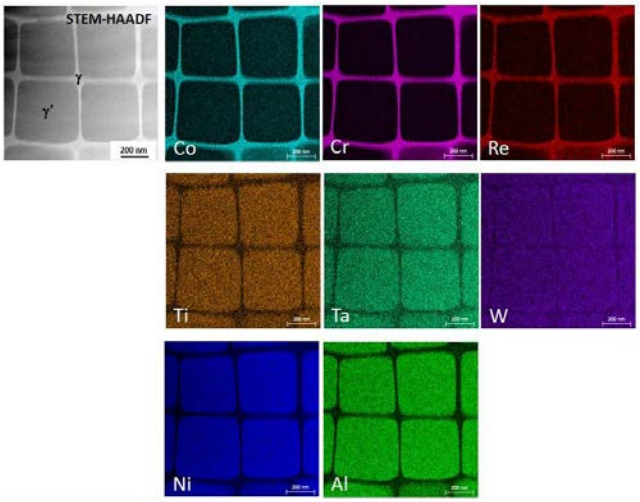

Fig 6. HRSTEM-EDX elemental maps of CMSX-4 single crystal superalloy used for aero engine turbine blade acquired with Titan Cubed G2 60-300 with ChemiSTEM technology.

The Centre possesses two SEM microscopes. Installed in 2009 the FIB-SEM dual beam NEON 40 EsB CrossBeam of Zeiss with EDX microanalysis system Quantax 200 (30mm^2 SDD) of Bruker system, FEG SEM column, SE and BSE modes is used for SEM investigation as well as TEM sample preparation and FIB-SEM tomography. Recently, in summer 2012, the IC-EM has launched the new SEM, a Merlin Gemini II equipped beside several detectors, with FEG, EDX microanalysis system Quantax 800 and EBSD Quantax CrystAlign 400.

The remaining scientific facilities of the Centre include a scanning probe microscope Dimension 3100 SPM, advanced light microscopes Axio Imager M1m and Stereo Discovery of Zeiss, computer-aided image analysis laboratory with several programs and mechanical properties testing equipment.

The comprehensive TEM sample preparation laboratory is mainly dedicated to metals, alloys, ceramics, composites and coatings. The laboratory is equipped with two low temperature electropolishing Tenupols of Struers, two room and LN2 temperature PIPS (Gatan) ion mill with low voltage (100V) and CCD camera for careful final polishing as well as the new ultra-low energy ion beam mill NanoMill 1040 of Fischione for post-processing of FIB lamellae for ultra-thin, clean samples required for advanced TEM analyses.

The IC-EM team is very active in collaboration with research and industrial partners. The team was involved in more than 150 scientific projects. At present, the IC-EM acts as a TEM training site for Central and Eastern Europe and collaborates with many research partners. Within ESTEEM2 project (http://esteem2.eu), the IC-EM provides the transnational access to its facilities for scientists who do not have such modern research instruments and infrastructure.

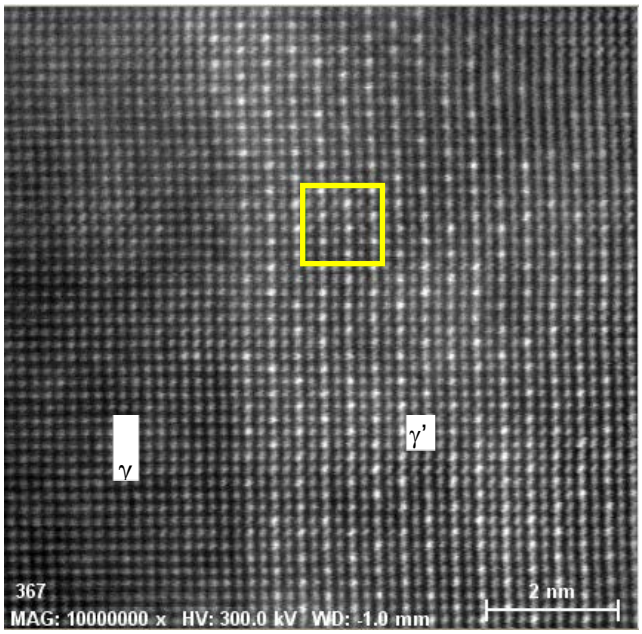

Fig. 7a. HRSTEM-HAADF image of the γ - γ' interface in Inconel 718 nickel-base superalloy for aeronautics and aerospace application.

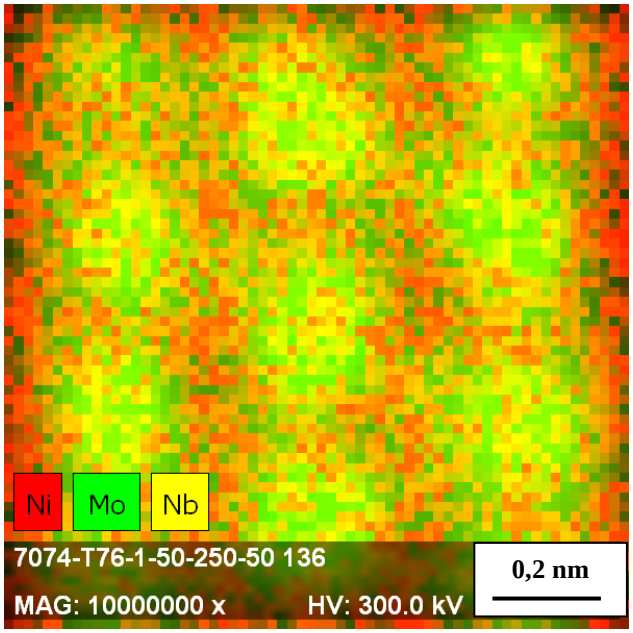

Fig. 7b. HRSTEM-EDX elemental maps of Ni, Mo and Nb in the γ' phase precipitated in Inconel 718 nickel-base superalloy. The image shows the enlarged scanned area marked by a yellow square in Fig. 7a.

PERSONALIA

At the 23rd International Congress of Theoretical and Applied Mechanics (ICTAM), Beijing, August 20-25, 2012 , new executives of the International Union of Theoretical and Applied Mechanics (IUTAM) were elected. Among them two Italian Colleagues: **Bernhard Schrefler** (UNIPAD, KMM-VIN core member) to IUTAM Bureau and **Giulio Maier** (POLIMI, KMM-VIN core member) as "Member-at-large" of the IUTAM General Assembly.

Giulio Maier (POLIMI) was awarded with PhD Honoris Causa of the Ton Duc Thang University, HoChiMinh City - Saigon, on August 15, 2012, at the international Conference Advances in Computational Mechanics (ACOME 2012) held there.

Aleksandra Czyrska-Filemonowicz (AGH-UST) has been elected (September 2012) to the Board of the European Microscopy Society.

Tomasz Moskalewicz (AGH-UST) obtained a Dr hab. degree (September 2012) for his work on „Influence of protective coatings on selected properties of titanium alloys".

Aldo R. Boccaccini (FAU) co-edited a new book (with N. P. Bansal) entitled "Ceramics and Composites, Processing Methods" John Wiley & Sons, Hoboken NJ 2012.

Aldo R. Boccaccini (FAU) chairs "International Conference on Biomedical Engineering **BioMed 2013"** (10th IASTED), Innsbruck, February 2013

KMM-VIN Members
(Institutions)

CORE MEMBERS

1. **AGH-UST** AGH-University of Science and Technology, Cracow, Poland
2. **AITEX** Textile Research Institute, Alcoy-Alicante, Spain
3. **BioIRC** Bioengineering Research and Developing Centre, Kragujevac**,** Serbia
4. **CIDETEC** Fundacion CIDETEC, Donostia/SanSebastián, Spain
5. **CISM Lab** Centro Internazionale di Scienze Meccaniche Spin-off, Udine, Italy
6. **CUT** Cracow University of Technology, Cracow, Poland
7. **DPS** Doosan Power Systems Ltd, Crawley, UK
8. **EMINATE** Eminate Ltd, Nottingham, UK
9. **FRAUNHOFER** Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V
   - **IFAM** Fraunhofer Institute for Manufacturing and Advanced Materials, Bremen, Germany
   - **IFAM-DD** Fraunhofer Institute for Manufacturing and Advanced Materials, Dresden, Germany
   - **IWM** Fraunhofer Institute for Mechanics of Materials, Freiburg, Germany
10. **IMBAS** Institute of Mechanics, Bulgarian Academy of Sciences, Sophia, Bulgaria
11. **IMIM** Institute of Metallurgy and Materials Science, Pol. Acad. Sciences, Cracow, Poland
12. **IMRSAS** Institute of Materials Research, Slovak Academy of Sciences, Kosice, Slovakia
13. **IMZ** Institute for Ferrous Metallurgy, Gliwice**,** Poland
14. **INTA** Instituto Nacional de Técnica Aeroespacial, Torrejón de Ardoz, Spain
15. **IOD** Foundry Research Institute, Cracow, Poland
16. **IPM** Institute of Physics of Materials, Brno, Czech Republic
17. **IPPT** Institute of Fundamental Technological Research, Pol. Acad.Sciences, Warsaw, Poland
18. **IS** Instytut Spawalnictwa, Gliwice, Poland
19. **ITC** Instituto de Tecnología Cerámica - AICE, Castellón, Spain
20. **ITME** Institute of Electronic Materials Technology, Warsaw, Poland
21. **MCL** Werkstoff-Kompetenzzentrum-Leoben Forschungsgesellschaft m.b.H. (Materials Centre Leoben), Leoben, Austria
22. **MERL** Materials Engineering Research Laboratory Ltd, Hitchin, Hertfordshire, UK
23. **ONERA** Office National d'Etudes et de Recherches Aérospatiales, Chatillon, France
24. **POLIMI** Politecnico di Milano, Milano, Italy
25. **POLITO** Politecnico di Torino, Torino, Italy
26. **R-TECH** Steinbeis Advanced Risk Technologies GmbH, Stuttgart, Germany
27. **TECNALIA** Fundación Tecnalia, Donostia-San Sebastian, Spain
28. **TUD** Technische Universität Darmstadt, Darmstadt, Germany
    - Department of Materials and Earth Sciences
    - Institute for Materials (IfW-MPA)
29. **TUG** Graz University of Technology, Graz, Austria
30. **TUW** Technische Universität Wien, Wien, Austria
31. **UH** University of Hertfordshire, Hatfield, Herts, UK
32. **UNIPAD** Università degli Studi di Padova, Padova, Italy
33. **UNIVPM** Università Politecnica delle Marche, Ancona, Italy
34. **UPM** Universidad Politécnica de Madrid, Madrid, Spain
35. **WRUT** Wroclaw University of Technology, Wroclaw, Poland
36. **WUT** Warsaw University of Technology, Warsaw, Poland

ASSOCIATE MEMBERS

1.	**ALSTOM**	Alstom Power Ltd., Rugby, UK
2.	**BEG**	Böhler Edelstahl GmbH & Co KG, Kapfenberg, Austria
3.	**BSGA**	Böhler Schweißtechnik Austria GmbH, Kapfenberg, Austria
4.	**BUDERUS**	Buderus Edelstahl GmbH, Wetzlar**,** Germany
5.	**CRF**	Centro Ricerche FIAT, Orbassano, Italy
6.	**CSM**	Centro Sviluppo Materiali S.p.A., Rome, Italy
7.	**EMPA**	Materials Science and Technology, Dübendorf, Switzerland
8.	**E.ON**	E.ON New Build & Technology Ltd., Coventry, UK
9.	**ETE**	Energietechnik Essen GmbH, Essen, Germany
10.	**EU-VRi**	European Virtual Institute for Integrated Risk Management, Stuttgart, Germany
11.	**FAU**	Friedrich-Alexander Universität Erlangen-Nürnberg, Germany
12.	**KEMA**	KEMA Nederland BV, Arnhem, Netherlands
13.	**LU**	Loughborough University, Loughborough, UK
14.	**MPA**	Materialprüfungsanstalt Universität Stuttgart, Germany
15.	**NPLML**	NPL Management Limited, Teddington, UK
16.	**SIEMENS**	Siemens AG, München, Germany
17.	**SIEMENSTurbo**	Siemens Industrial Turbomachinery AB, Finspong, Sweden
18.	**SSF**	Saarschmiede GmbH Freiformschmiede, Völklingen, Germany
19.	**SUT**	Slovak University of Technology, Trnava, Slovakia
20.	**SVUM**	SVÚM a.s., Prague, Czech Republic
21.	**SWG**	Schmiedewerke Gröditz GmbH, Gröditz, Germany
22.	**SZMF**	Salzgitter Mannesmann Forschung GmbH, Duisburg, Germany
23.	**TUC**	Chemnitz University of Technology, Chemnitz, Germany
24.	**VAGL**	voestalpine Giesserei Linz GmbH, Linz, Austria
25.	**VGTU**	Vilnius Gediminas Technical University, Vilnius, Lithuania
26.	**V&MD**	Vallourec & Mannesmann Tubes, V&M Deutschland GmbH, Düsseldorf, Germany
27.	**VSB**	Technical University of Ostrava, Ostrava, Czech Republic
28.	**VTT**	VTT Technical Research Centre of Finland, Espoo, Finland
29.	**VZU**	Výzkumný a zkušební ústav Plzeň s.r.o., Plzeň, Czech Republic

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