

# KMM-VIN Newsletter

*Issue 5, December 2011*



## In this Issue:

<b>Editorial</b>	<b>1</b>
<b>Latest News</b>	<b>2</b>
<b>What's new in Working Groups</b>	<b>3</b>
<b>KMM Projects</b>	<b>6</b>
<b>Cooperation</b>	<b>9</b>
<b>Research Fellowships, Trainings, Research Positions</b>	<b>9</b>
<b>Presentations</b>	<b>10</b>
<b>Personalia</b>	<b>12</b>
<b>KMM-VIN Members</b>	<b>13</b>

## EDITORIAL

We are presenting the new Issue of the Newsletter of the European Virtual Institute on Knowledge-based Multifunctional Materials (KMM-VIN).

The Institute was established in 2007 as the main achievement of the Network of Excellence KMM-NoE (FP6). The legal status of KMM-VIN is that of Belgian international non-profit association (AISBL). KMM-VIN AISBL is registered in Brussels and comprises currently 37 core and associated members (research centres, universities, industry and SMEs) from 13 European States.

KMM-VIN offers integrated basic and applied research, educational and innovation activities in the field of advanced structural and functional materials.

The Winter Issue 2011/12 of the Newsletter contains the usual columns and one special article in a new column "Presentations" that will introduce some core and associate KMM-VIN members who may not be well known to our community as they joined the AISBL rather recently. We commence this Column with presentation of the Textile Research Institute AITEX.

The most important part of each KMM-VIN Newsletter are the news from the Working Groups, which until now have been: WG1 – Intermetallics, WG2 – Composite Materials, WG3 – Functionally Graded Materials and WG4 – Functional Materials. This setting may soon be transformed into a new one oriented at selected industry sectors defined as target sectors for KMM-VIN research. The new structure should also better accommodate potential extensions of the KMM-VIN thematic scope to new classes of structural or functional materials.

In the column "KMM Projects" you can find updates from the European projects and selected national projects where

KMM-VIN members are involved in. Special attention is given to FP7 projects coordinated by KMM-VIN, namely the running FP7 project MATTRANS (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") which about to start after successful negotiations.

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

In the column "Research Fellowships, Trainings, Research Positions" information on the results of the 3<sup>rd</sup> Call of KMM-VIN Research Fellowships programme are given. The RF programme will be continued in the 4<sup>th</sup> call in 2012.

The former Summer Schools of the KMM-NoE project is reactivated in cooperation with the International Centre for Mechanical Sciences (CISM), Udine, Italy. Details on the first KMM-VIN Advanced Course on tissue engineering mechanics (September 17 - 21, 2012) are given.

In "Personalia" information on awards, distinctions and some organisational involvements of our Colleagues are presented.

The contact details of the KMM-VIN offices are 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](http://www.kmm-vin.eu).

*Marek Janas, Editor*

## LATEST NEWS

### NEW STRUCTURE OF THE WORKING GROUPS

At the forthcoming KMM-VIN General Assembly in February 2012 a new organization of Working Groups will be proposed to give a better frame for partners' research activity in view of the envisaged KMM-VIN expansion towards the industry (it was one of the basic elements of KMM-VIN concept at its incorporation in 2007, and a requirement of the INN-VIN project submitted in 2011 by KMM-VIN and 21 of its members). In the meantime the new FP7 CSA project INN-VIN has been accepted by the Commission. The new Working Groups will better correspond to the usual structure of NMP Workprogrammes and fit better with the projects that many of our Members and KMM-VIN itself are involved in. Such structure should appear more clear to potential external clients of KMM-VIN. The proposed WG's setting is described in more detail in the column "What's new in Working Groups".

### RECENT EVENTS

Two large European conferences accompanying the Polish presidency of the EU were held in the field of materials and manufacturing:

- **FUMAT2011** ("Future Materials for Grand Challenges of our time"), 22-23 September 2011, Warsaw.
- **MANUFUTURE 2011** ("West and East Europe in global High Added Value manufacturing – facts of today and challenges of tomorrow") 24-25 October 2011, Wrocław.

KMM-VIN members IPPT and WUT as well as KMM-VIN itself were actively involved in the programming and organisation of FUMAT2011. More on this conference and its outcomes – see KMM Projects.

**European Ceramic Competitiveness Cluster** was organized on 18-19 October 2011 at Technopôle, Limoges (FR), the 4th edition of CERAMIC Network 2011, including the conference "Ceramics in construction, shaping the future" with an active participation of ITC (Dr Arnaldo Moreno).

**The International Centre of Electron Microscopy for Materials Science** at AGH, Krakow launched on 13 October 2011 a unique (the third in the world) Titan<sup>3</sup> G2 60-300 electron microscope with ChemiS-TEM technology (see also "KMM Projects").

**E-MRS 2011 FALL MEETING** was held, as always, in Warsaw, 19-23 September 2011, hosted by Warsaw University of Technology,

**EUROMAT 2011**. European Congress on Advanced Materials and Processes was held in Montpellier, 12-15 September 2011; <http://euromat2011.fems.eu/>. For the multiple involvements of the KMM-VIN members in EUROMAT 2011, see Newsletter 4 ("Personalia").

### FORTHCOMING EVENTS

**KMM-VIN GENERAL ASSEMBLY** annual meeting will be held in Brussels on 22 February 2012. Taking into account the structure changes in working groups to be proposed and also potential membership enlargement by applicants who have contacted KMM-VIN recently, this General Assembly may turn out an important meeting for the KMM-VIN future.

**GlaCERCo** Initial Training Network coordinated by POLITO (see the column "Projects") will hold its Annual meeting and Workshop in Brno (CZ) on 8-10 February 2012. Registration for non-GlaCERCo members is now open.

**MATRANS (FP7)**, an FP7 cooperative research project coordinated by KMM-VIN (see also "KMM Projects") will hold its M24 project meeting on February 23-24, 2012 in Brussels.

The **4<sup>th</sup> iNTEg-Risk Conference 2011** will take place in Stuttgart, Germany on 7-8 May 2012. The abstract submission is already open at: <http://www.eu-vri.eu/fwlink/?LinkID=335>

### KMM-VIN Advanced Course at CISM

A one-week KMM-VIN Advanced Course on "Skeletal tissue engineering mechanics, with links to biology, chemistry, and medicine", coordinated by Prof. Christian Hellmich (TUW) and Aldo Boccacini (FAU) will be held at CISM (Udine, Italy), 17-21 September 2012.

# WHAT'S NEW IN WORKING GROUPS?

## NEW STRUCTURE OF THE WORKING GROUPS (Proposal)

The current WG structure emphasizing materials classes (**WG1: Intermetallics**, **WG2: Composite Materials**, **WG3: FGMs** and **WG4: Functional Materials**) seemed not very clear for potential clients of KMM-VIN. Also, in the FP7 CSA project INNVIN, coordinated by KMM-VIN, we had to declare industry sectors that KMM-VIN would be targeted at.

After giving this issue a thorough thought, the Governing Council and the Board of Directors have agreed that the new Working Groups should deal with **materials for specific industry sectors** for which KMM-VIN has the necessary expertise and will, thus, propose to the upcoming KMM-VIN General Assembly a new structure consisting of:

**WG1. Materials for Transport**

**WG2. Materials for Energy**

**WG3. Biomaterials**

**WG4. Modelling**

The WG4 Modelling is a **horizontal group**, cross-cutting the vertical WG1, WG2, WG3 for obvious reasons. Its creation reflects the modelling potential of KMM-VIN partnership and better fits the interests of prospective new members dealing with materials modelling.

## NEWS FROM WG1: INTERMETALLICS

The main research activities in the WG1 have been within the JOINING task and on work concerning the effect of electromagnetic treatment on the corrosion resistance of materials. The investigating partners in the JOINING task are POLITO, UH and AGH. The work is concerned with the development of a glass-ceramic sealant for solid-oxide fuel cells (SOFCs) and aims to hermetically seal the Crofer 22 interconnect and yttria-stabilised zirconia (YSZ) which acts as the anode-supported electrolyte (ASE). The most recent work has focused on the thermal cyclic behaviour of the sealant from 800°C down to room temperature for periods of up to 3000 hours (which was much higher than the 500 hours that has been used in our reported work so far). The thermal cyclic treatment involved two treatments; heating at 800°C for 176 hours followed by either cooling slowly in the furnace down to room temperature for 24 hours or by cooling down in air and then repeating the same cycle until 3000 hours. Examination of the samples using SEM revealed that there was no difference between slow and fast cooling in the behaviour of the sealant after 3000 hours. In both cases diffusion of chromium and manganese into the glass-ceramic was observed; at the same time both sodium and calcium were observed to diffuse deeper into the glass-ceramic and away from the interface between the Crofer 22 and the glass-ceramic. A line scan showing this behaviour is shown in Fig. 1. This was a welcome observation because the diffusion of sodium away from the interface prevented it from coming into contact with chromium and thus prevented formation of volatile sodium chromate. As observed previously for treatments of up to 500 hours, there was diffusion of aluminium that was present in the Crofer 22 into areas adjacent to the protective oxide layer. This was observed in the form of numerous,

small and discontinuous pockets of Al<sub>2</sub>O<sub>3</sub> that tended to surround voids that were created as a result of the diffusion of chromium and manganese into the sealant. While this did not appear to be serious after 500 hours, prolonged treatment for 3000 hours led, in some areas, joining up of the pockets of voids to create larger and elongated holes just below the protective oxide layer as shown in Fig. 2. This observation is of great concern as there is a danger of cracks developing within the Crofer 22 leading to spallation of the protective oxide layer. As the area just below the protective oxide layer is likely to be depleted of chromium, the repair of the protective oxide layer following spallation may be difficult and interfacial failure may thus occur. The work that will follow will try to minimise the possibility of such an outcome by using a more effective pre-oxidation treatment for Crofer 22 to minimise the diffusion of chromium and manganese.

An investigation on the effect of electromagnetic processing on the corrosion behaviour of structural metals has commenced since publication of the last newsletter. Dr Anatolii Babutskyi (from former KMM-VIN member IPSUA) is now working at the UH for a period of 24 months on a project funded by the Marie Curie In-coming Fellowship scheme. The most significant result so far has been the observation of a reduction of the corrosion of commercial purity titanium in the presence of NaF and SnF<sub>2</sub> solutions. In the case of corrosion testing in NaF, this observation was associated with a change in the grain structure of the Na<sub>3</sub>TiF<sub>6</sub> corrosion product that formed on the surface of the titanium. This is a very interesting observation and is thought to be due to a reduction of the residual stresses within the metal. Work is now being planned to investigate the effect of the treatment on the residual stresses and dislocation density and this will involve UNIVPM and AGH.

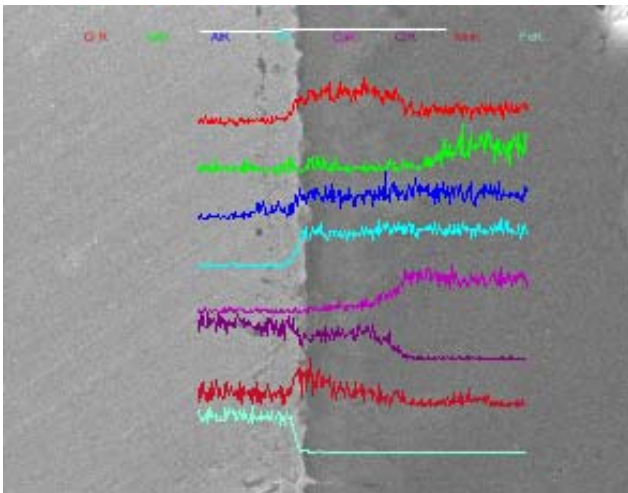


Fig. 1 Elemental line scans from the interface between Crofer 22 and the glass-ceramic sealant following 15 slow cool thermal cycles from 800°C and total treatment of 3000 hrs.

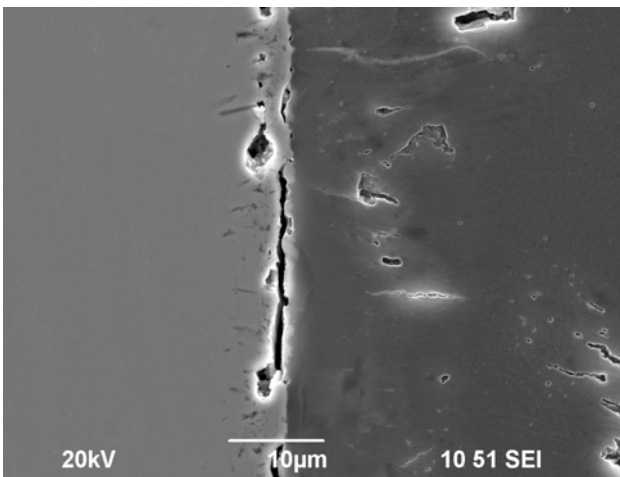


Fig. 2 Development of large voids within the Crofer 22 protective oxide layer (after 15 rapid cooling cycles from 800°C; total treatment of 3000 hrs).

Andreas Chrysanthou, WG1 Coordinator

## NEWS FROM WG2: COMPOSITES MATERIALS

This column, is devoted to a recent project coordinated by AITEX .

On 1<sup>st</sup> January 2012 begins the LIFE<sup>+</sup> project **WET-COMP: Wet-laid technology application for textiles residues revalorization in composites industry**. The project is coordinated by AITEX and has as partners Ostthüringische Materialprüf-gesellschaft für Textil und Kunststoffe mbH (Germany) and Asociación Valenciana de Empresarios del Plástico (Spain). The main objective of **WET-COMP** is to validate and demonstrate that the wet-laid technology is useful for obtaining a lot of different textile non-woven materials obtained from textile wastes, revalorizing these type of wastes in form of composites for technical

applications, reducing, as well, the wash-off of these wastes.

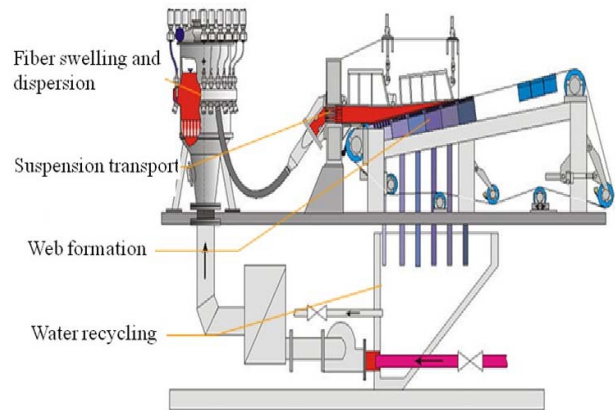


Fig. 3. Wet-laid process

The principle of wet-laying is similar to paper manufacturing. The difference lies in the amount of fibres present in a wet-laid nonwoven. A dilute slurry of water and fibres is deposited on a moving wire screen and drained to form a web. The web is further dewatered, consolidated, by pressing between rollers, and dried. Impregnation with binders is often included in a later stage of the process. The strength of the random oriented web is rather similar in all directions in the plane of the fabric. A wide range of natural, mineral, synthetic and man-made fibres of varying lengths can be used. The wet laid process allows different fibres to be intimately blended to give a tailored product which exhibits the optimum properties of each fibre type.

Previous R&D projects have shown that this technology is useful for obtaining some non-woven materials from textile wastes but it will be very innovative to get a global vision for the textile/composites sectors on the possibilities of this technology, which wastes can be revalorized, for which technical application and which are the economical/environmental benefits. The project also aims at elaborating a common Procedure for Textile Wastes Revalorization using Wet-Laid technology applicable in spinning and weaving/knitting subsectors and defining the different applications in composites sector. Also it aims at validating the enterprise benefits applying wet-laid technology to obtain textile reinforcements for composites derived from textile wastes. The non-woven materials obtained by means of properly application of textile wastes in wet-laid process will be used as composites reinforcement. Several composite manufacturing techniques will be considered to obtain the final products.

Aldo R. Boccaccini, WG2 Coordinator

## NEWS FROM WG3: FUNCTIONALLY GRADED MATERIALS (FGMs)

Due to the imminent restructuring of the Working groups, this is probably the last time for writing a "What is new in WG3"-article. Having been collected under the KMM-NoE-induced title "Functionally graded materials", WG3 has been the home of innovative, non-classical ideas directly from its very start in 2005, then extending the KMM-NoE topics to the "bio-realm". But the aim was never to be swallowed by main stream bio-research, but to leave unique traces of discovery, which become feasible only through the coordinated and jointly supported activity of engineers, physicists, and material scientists. One of the more recent milestones of the "core partners" TUW, WUT, and UNIVPM has recently been completed, the project BIO-CT-EXPLOIT, lead by TUW, where tangible and sustainable solutions for direct industrial use were provided for SMEs working in the biomedical sector. On the other hand, partners of WG3 have been the original nucleus of the COST action NAMABIO, managed by UNIVPM, which is probably one of the only projects worldwide, where the tissue engineering, biology and medical scene, represented by world-leading experts, ever entered a year-long and deep discussion with KMM-VIN scientists. Our first meetings and workshops showed that the differences in language and scientific perceptions might turn out as huge, but that, if the right people meet, unprecedented knowledge gains with practical outcomes become a clear vision, rather than a faint illusion. Thus, we are happy that we could help creating a momentum towards the "re-integration of natural sciences", a fundamentally important task according to the eminent physicist and engineer Maurice A. Biot, celebrated as the father of so-called "Poro-Mechanics", who, as early as in 1962, deplored the extreme and deteriorating fragmentation of natural sciences and engineering disciplines. But even if we may successfully work on the re-unification of sciences, there often seems to exist an unsurmountable gap between science and technology on the one side, and the rest of life on the other - especially the creative and artistic side. And in this respect, a unique project lead by Prof. Franco Rustichelli ([www.iswaproject.eu](http://www.iswaproject.eu)) reminds us that this is a quite unnatural state introduced by 19th-century romanticism, while science and arts were still seen as a unity by intellectual and creative giants such as Leonardo da Vinci. It is the "Immersion of Science Through the Arts", in particular focusing on school children, but also on the general public, which 14 partners from academia, from the industry and the art sector (UNIVPM, TUW, IPPT, IMRSAS from KMM-VIN) undertake through exhibitions, ballet, music, and cinema performances, throughout our continent - reminding us of the beauties the human mind can reveal, in whichever form - ... and from a very pragmatic viewpoint concerning side products exploitable by KMM-VIN, helping to nurture the next generation dealing with knowledge-based multicomponent materials.



Fig. 4 Science and Arts: a Baroque allegory revived through "an experimental approach" ([www.iswaproject.eu](http://www.iswaproject.eu))

Christian Hellmich, WG3 Coordinator

## NEWS FROM WG4: FUNCTIONAL MATERIALS

The working group consists of the following eight partners: Fraunhofer IFAM, CIDETEC, IPM, POLITO, AITEX, Centro Ricerche FIAT, AGH and ITC. Collecting the specific interests and expertise from the partners the main fields of activities can now be summarized:

- materials and processes based on electrochemical techniques
- functional polymers
- biomaterials
- materials for energy storage and energy conversion

Since January 2011 AITEX has been coordinating the EU project All4Rest. All4Rest is focused on the development of comfort-improved rest Systems, using non-obtrusive technologies that promote deeper, more restorative sleep and prevent nocturnal awakenings. The successful solutions will reduce awakenings and reduce sleep onset latency. Within the global comfort improvement, physical and thermal parameters will be investigated, establishing quantitative and qualitative evaluation of comfort and sleep quality system. To achieve it, use of biomaterials and research of new ones, eco-friendly technologies and processes in fabrics destined to rest will allow the development of new products focused on obtaining an improved rest system.

The project is coordinated by AITEX (SP) and other RTD performers are UGENT (BL), ITA (DE), ITCF (DE) and CENTEXEL (BL). The SMEs are COLCHONES EUROPA (SP), AVITEX (BL), DAKOTA COATINGS (BL), DEVAN MICROPOLIS (PT), INNOVA (NL), MULTILOT (DE) and 3T(DE). Also the NAVARRA HOSPITAL (SP) is collaborating in the project. Through the several innovations proposed, which are totally focused to improve the quality life and health of end users (importance of good sleep for good mental and physical health may seem obvious) different expected results will be attached:

- Bed systems (mattress, mattress ticking, pillow, pyjamas, bed clothes), which avoid sleeping problems;
- New functionalized hotmelts;
- Processes developed for application of functionalised renewable hotmelts;
- New heatable textiles: microcapsules, textiles with microcapsules included,
- New comfort compounds (microcapsules and inks) with scentic and/or electroconductive properties;
- New sensors integrated in textiles for monitoring sleeping movements and react with heatable system;
- Production technologies and methods to produce the textiles.

The KMM-VIN partner ITC, as an active member of ELIARE SUDOE NETWORK: "Establishing links to augment research in Europe with network in Sudoe", had organised last 15-16 June 2011 the 3<sup>rd</sup> Eliare Network Sudoe Scientific Seminar: "Forging winning proposals FP7/CIP". The Eliare Network Sudoe (ENS) is a project coordinated by the Regional Council of Limousin in the framework of European Interregional Cooperation programme "Interreg SUDOIEVB". 9 universities within the Sudoe territory (Southwest France, Spain and Portugal) constitute this network. The project aims to create the conditions for a wider participation of SUDOE research stakeholders to EU R&D.

The seminar was held in Castellón with a different and successful methodology. Innovation, environment, accessibility and urban sustainable development are the priorities of this project coordinated by Conséil du Limousin (France). To improve Seminar efficiency the Scientific Network Coordinators proposed a new methodology, based on a previous topic detection work to be done by each partner. The Scientific Network Coordinators – in collaboration with the partners – compiled and selected the most potential topics for each thematic area, increasing the dynamism of the scientific meetings.

The UCLM University (Universidad de Castilla - La Mancha in Madrid) takes advantage of a project transferring good practices from ITC. The good practices implemented and presented by ITC were related to the creation of the European Projects Office, with the main objective to promote the interest, awareness and participation in the RTD EU funding programmes. Other universities like University Miguel Hernández of Elche (Alicante, Spain) and other technological centres are interested in the implementation of the European Projects Office as well.

*Thomas Weissgärber, WG4 Coordinator*

## KMM PROJECTS

During the past six months KMM-VIN has continued, as coordinator or partner, the execution of several FP7 projects, e.g. : MATRANS, iNTeg-Risk, MUST, M-FUTURE2011. The INNVIN CSA (FP7) project, submitted by KMM-VIN and involving twenty one KMM-VIN members who had expressed interest in it, has successfully accomplished the negotiations with the Commission and will start in the first quarter of 2012. Also, there is a number of successful proposals coordinated by KMM-VIN members and involving different groups of KMM-VIN members, without KMM-VIN itself being included in the consortia. To this end the following projects should be named: ISWA, JOLIE, NAMABIO, GLaCERCo.

### **MATRANS** (FP7)

**"Micro and Nanocrystalline Functionally Graded Materials for Transport Applications"** – project coordinated by KMM-VIN (M. Basista) started 1 Feb. 2010, duration 3 years. The consortium consists of 10 Beneficiaries and 6 third parties in the so-called KMM-VIN grouping (IPPT, IMIM, ITME, TUD, UNIVPM, POLITO – all KMM-VIN core members). Among the project Beneficiaries there are also 3 other KMM-VIN members: CRF, FHG (IFAM-DD) and R-TECH. The project webpage: <http://matrans.kmm-vin.eu>.

It 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/copper alloys and alumina ceramics-intermetallics. The total EC funding of the project is 3.6 M€ with the KMM-VIN grouping's share of 2.38 M€.

For details of the organisation and results please consult the "Matrans Newsletter 2011" at the site [Projects/Matrans/Public-documents](http://Projects/Matrans/Public-documents) of [www.kmm-vin.eu](http://www.kmm-vin.eu) webpage.

### **iNTeg-Risk** (FP7)

**"Early Recognition, Monitoring and Integrated Management of Emerging New Technologies Related Risks."** A large 4.5 year project started in December 2008, coordinated by KMM-VIN member - European Virtual Institute for Integrated Risk Management (A. Jovanovic). KMM-VIN grouping comprising itself and 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 total share of KMM-VIN grouping (4 members) in the EC funding is 185.5 k€; <http://integrisk.eu-vri.eu>.

**M-FUTURE 2011** CSA project (FP7)  
“**Materials & Manufacturing of the FUTURE**”.

The M-FUTURE project was devoted to two NMP events accompanying the Polish presidency of the EU in the field of materials and manufacturing: **MANUFUTURE 2011** (“West and East Europe in global High Added Value manufacturing – facts of today and challenges of tomorrow”) 24-25 October 2011, Wroclaw (PL) and **FUMAT2011** (“Future Materials for Grand Challenges of our time”), 22-23 Sep. 2011, Warsaw, <http://www.fumat2011.eu>.

The FUMAT 2011 conference was aimed at discussion on the fundamental question: *How materials of the future can contribute to the strategies and solutions for the grand societal challenges?*

The Conference consisted of three plenary (panel) sessions:

- i. Advanced Materials and Grand Challenges,
- ii. International partnership in materials research,
- iii. Synergy of resources in materials development

and thematic sessions in 5 parallel tracks:

- T1: Materials for Future Energy
- T2: Materials for Transport and Environment
- T3: Materials in Health, Ageing Society and Bio-applications
- T4: Materials for Sustainable Development
- T5: Societal dimension of advanced materials, Education, Trainings, Increase of awareness.

KMM-VIN members contributions concerned: EIT KIC NewMat project (A. Czyrska-Filemonowicz, T1) and the combined effort of KomCerMet and MA-TRANS projects (M. Basista, T2). A publically accessible outcome of FUMAT2011 will be the Position Paper, which is now under preparation with an active role of KMM-VIN.

**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).

The INNVIN project is one of 5 CSA projects originated by the former 14 Networks of Excellence in G3 Materials Unit of NMP. On 15 Dec. 2011 the negotiations with the EC were successfully completed. All five CSA projects are considered as a cluster, i.e. they will start on the same date in the beginning of 2012.

INNVIN involves KMM-VIN as the beneficiary and 21 of KMM-VIN members as third parties linked to KMM-VIN. The rationale behind INNVIN is as follows:

KMM-VIN has reached a considerable level of internal integration and organizational stability in some domains typically attributed to NoEs. While collaborative research and mobility programme are running reasonably well, the R&D and training services for industry are not yet fully satisfactory. The primary objective of INNVIN project 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. KMM-VIN will primarily focus on Transport, Energy and Biomedical sectors as these are the ones where KMM-VIN’s expertise has reached a critical mass.

A set of measures is proposed to reach this objective: Survey of technology needs in Transport, Energy and Biomedical sectors, Update of contents and enhancement of functionalities of KMM expertise and equipment database, Dissemination campaign of KMM-VIN research, infrastructure and training potential, Recruitment of new KMM members from industry. An important by-product of this strategic plan is to satisfy the economic criteria of an SME as this status can be beneficial for KMM-VIN financial stability in the long term. EC funding for KMM-VIN consortium: 444.000 €.

**NAMABIO** (COST) - Materials, Physical and Nanosciences COST Action MP1005: “**From nano to macro biomaterials (design, processing, characterization, modelling) and applications to stem cells regenerative and dental medicine**”.

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 2<sup>nd</sup> Call for applications for Short-Term Scientific Missions for NAMABIO members is open [http://www.cost.esf.org/domains\\_actions/mpns/Actions/namabio](http://www.cost.esf.org/domains_actions/mpns/Actions/namabio)

**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, with 3.9M€ funding during 4 years; [www.glacercoco.eu](http://www.glacercoco.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 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). 14 calls for research positions are now open (see the column “Research Fellowships, Trainings and Research Positions”).

#### **ISWA** (FP7)

“**Immersion in the Science Worlds through the Arts**”. A CSA project coordinated by UNIVPM (F. Rustichelli) started 1 March 2011 for 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 will be realized and displayed in several European cities.

#### **SILICOAT** (FP7)

“**Industrial implementation of processes to render RCS safer in manufacturing processes**” – European project coordinated by ITC; its Grant Agreement was signed on 3 November 2011. The partners are: Associations of companies of tile manufacturers like ASCER, APICER, ZIEGEL, and companies like the Spanish PORVASAL, ATOMIZADORA, Italian CERAMICA FLAMINIA, S.p.A., German AKI-Arbeitsgemeinschaft Kerami, WALKÜRE and research centres like Centro Ceramico di Bologna, Fraunhofer Institut für Toxik (ITEM- Fraunhofer). Crystalline silica is an essential raw material for the production of virtually all the goods of everyday life. However, Respirable Crystalline Silica (RCS) are classified as strongly carcinogenic for humans. The main objective of the present project is the industrial implementation of treatments in the ceramic manufacturing processes transforming the quartz-containing raw materials into intrinsically safe products.

## **NATIONAL PROJECTS OF KMM-VIN MEMBERS**

#### **KomCerMet** (Poland; EU Structural Funds)

“**Metal-Ceramic Composites and Nocomposites for Aerospace and Automotive Industry**”. A Polish key project supported by the EU Structural Funds. Started in 2008, originally planned to end in September 2012, will be extended until 30 June 2013. Coordinated by IPPT (M. Basista), consortium of 12 partners including 5 KMM-VIN members (IPPT, ITME, IMIM, WUT, AGH-UST). Its 7<sup>th</sup> Workshop was held on 27-28 Sept. 2011 at IPPT in Warsaw and 8<sup>th</sup> Workshop will be held on 20-21 March 2012 at IPPT. <http://www.komcermet.ippt.gov.pl>.

#### **POLIMI research in mechanical characterisation by microindentation tests**

*Results by Laboratory of Biological Structure Mechanics (P. Vena, D. Gastaldi):*

##### **1. Mechanical characterisation of biological tissues at small length scale.**

The nanoindentation at different penetration depth is used to characterize hard tissues like cortical bone as well as soft tissues like articular cartilage. The hierarchical arrangement of tissue constituents gives a length scale dependence of the tissue mechanical response. For characterization of cartilage tissue nanoindentation tests in a liquid cell are carried out. Finite element modeling of the experiments is used to determine relevant constitutive parameters with specific reference to anisotropic properties of the tissues. Constitutive equation for the tissue are also developed and relevant parameters are obtained by means of numerical simulations in both time and frequency domain.

##### **2. Mechanical characterization of thin metal, ceramic and functionally graded coatings.**

Nanoindentation and scratch tests are used to characterize thin (few microns) layers of materials on suitable substrates. In particular, thin ceramic (alumina) layers as well as metal/ceramic nanolayers have been investigated through indentation tests at multiple load levels. Thin metal coatings on compliant substrates with potential applications in the flexible electronics industry are currently investigated. In this context, nanoindentation technique is used to determine metal/polymer interactions and in particular, the capability of the metal film to undergo finite strain and or finite curvature without delamination from the deformable substrate.

*Results by the team headed by G. Maier and G. Bolzon:*

##### **3. Diagnostic analysis of metal structures by parameter identification based on indentation tests.**

Novelties of the proposed diagnosis procedures with respect to the state-of-the-arts in industrial environments: selection of "grid nodes" within a search domain "proper orthogonal decomposition", "trunca-

tion" and interpolations by "radial basis functions" for fast simulations within algorithms for "in situ" inverse analyses by minimization of the discrepancy function; experimental data, selected by sensitivity analyses, consisting of: either both indentation curves and imprint profiles (patent with an oil industry, namely Vetec company), or indentation curves alone achieved by using elliptical indenters in three tests, or only imprint profiles generated by dynamical indentation ; discrepancy minimization by mathematical programming ("trust region algorithm") in situ using small computers; identification of elastic-plastic parameters or/and residual stresses.

#### **4. Mechanical characterization of free-foils (paper, paperboard, laminates, membranes) by cruciform and sandwich tests.**

Novelties of the proposed procedures with respect to the state-of-the-arts in industrial environments: non-uniform stress field in the specimen during the testing process; digital image correlation technique for many displacement measurements; anisotropic elastic-plastic models (particularly Xia-Bioce\_Parks model, "simplified" with smaller number of parame-

ters ) to be calibrated; two-dimensional FE simulations; inverse analyses either by artificial neural networks or by "trust region algorithms", both made economical by preparatory "proper orthogonal decomposition"; compression tests by a novel "sandwich instrument" (with specimen stabilizers of elastic polymeric materials); collaboration with Tetrapak company producing food containers.

**AGH University of Science and Technology, Krakow:** a unique Titan<sup>3</sup> G2 60-300 electron microscope has recently been installed at the International Centre of Electron Microscopy for Materials Science headed by Prof. Aleksandra Czyrska-Filemonowicz. It was launched on 13<sup>th</sup> October 2011, during the conference dedicated to scientific co-operation with North-Rhine-Westfalia. It is the third in the world ultimate performance analytical electron microscope offering a 70 pm resolution in imaging and EDX mapping microanalysis in probe corrected STEM at high (300 kV) and low (60 kV) accelerating voltage. More information at: <http://www.tem.agh.edu.pl>.

## **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. This has, in a natural way, promoted KMM-VIN in the industrial and research communities in Europe. By operating the EuMaT Secretariat KMM-VIN members have had the first hand and timely access to all kinds of materials-related information on the European level.

KMM-VIN cooperates closely with the EuMaT Steering Committee in the "Alliance for Materials" (A4M) created by EuMaT and five other Technological Platforms which have materials agenda in their scope.

A4M was one of the highlights of the FUMAT2011 Conference in Warsaw and is now cooperating with EMRS and FEM materials societies on a large materials related initiative of a European dimension.

## **KMM-VIN RESEARCH FELLOWSHIPS, TRAININGS and RESEARCH POSITIONS**

### **KMM-VIN Research Fellowships**

The KMM Mobility Programme includes Research Fellowships intended for PhD-students and early stage researchers from the KMM-VIN member institutions (more info: [www.kmm-vin.eu/LatestNews](http://www.kmm-vin.eu/LatestNews))

In the **3<sup>rd</sup> Call** 9.5 person-months (including four person-months funded by POLITO through the Professors Margherita and Pietro Appendino Grants) had been granted. By the end of December 2011, all participants will have successfully accomplished their research stays, also some of the reports have

meanwhile been received. In addition, one research stay awarded in the 2<sup>nd</sup> call and postponed to 2011 was also completed in September this year.

The **4<sup>th</sup> Call** for KMM-VIN Research Fellowships will be opened in February 2012. The deadline for applications will be March 31, 2012.

Please inform young researchers and PhD students from your groups about this mobility programme to do research in other KMM-VIN members teams.

## KMM Summer Schools at CISM Reactivated

A one-week KMM-VIN advanced course “**KMM-VIN – Skeletal Tissue Engineering Mechanics, with Links to Biology, Chemistry and Medicine**” to be hosted – similarly as the KMM-NoE Summer Schools in the past – at CISM (Udine, IT) is scheduled on 17-21 September 2012. The course coordinators are Ch. Hellmich (TUW) and A.R. Boccaccini (FAU); other lecturers are: Kalpana Katti (USA), Vladimir Komlev (Russia), Damien Lacroix (Spain) and Laurence Vico (France). Details on the course may be found at <http://www.cism.it/courses/C1211/>.

## Research positions offered

14 positions for Early Stage Researchers and Experienced Researchers are now offered by the Initial Training Network (FP7-People) GlaCERCo-ITN “Glass and Ceramic Composites for High Technology Applications” coordinated by POLITO. KMM-VIN members in this network: FAU, IPM, MERL, POLITO made available 10 offers for 16½ person-years in the period 2012-2014. Research profiles for these offers and application details can be viewed at: [www.glacercoco.eu](http://www.glacercoco.eu) pages Vacancies and GlaCERCo recruitment Gantt in PDF.

## PRESENTATIONS

*We launch this new column with the self-introduction of AITEX. More on AITEX activities in the specific KMM domains may be found in the columns News from WG2 and WG4 based on the recent projects coordinated by AITEX: **WET-COMP** and **All4Rest**.*

### AITEX - Textile Research Centre

is a private non-profit making association established in 1985. Its objectives are to improve the competitiveness of textile companies, promote modernisation actions, introduce new technologies and improve company competitiveness and product quality.

AITEX acts on behalf of Spanish as well as overseas textile and clothing industries and thus has a strong industrial representation. Around 900 companies are associated to the institute and around 33% of the Spanish textile and clothing companies are regular customers. There are 135 qualified professionals working for AITEX and have as their main goal the optimum development of activities addressed to assist the textile and clothing sector. The many different tasks that the Institute fosters include Standardization and quality, I+D Projects, European projects, New Technologies and Training.

The AITEX infrastructure is specially headed towards the development of R+D+I projects and activities of general interest to the sector. On the one hand, AITEX takes part in activities dealing with confidential applied research to improve products, applications and processes and on the other, it co-operates with international entities, other research centres and textile companies all around Europe to develop transnational projects through the creation of international research partnerships and consortiums.

### Organisational structure – –Technical delegations

Our aim is to bring AITEX closer to industrial areas and we are based at:

- Alcoi (headquarters). SPAIN
- Valencia (Fashion division)
- China. Shanghai,
- India. Delhi,

- Pakistan. Karachi,
- Canada, Mexico, Brazil, Lithuania.

### Activities

#### Chemical-Physical laboratories

- Textile physics
- Textile chemistry
- Microbiology
- Water for industrial uses
- Filtration
- Control of harmful substances
- The environment

#### Geotextile, Automobile, Filtration, Medical and Personal Hygiene Textiles, Textiles in Architecture, Geotextiles and Sports Surfaces Laboratories

#### Fire performance, comfort, personal protective equipment (PPE) and electric arc laboratories.

#### Ballistic and stab protection laboratories.

#### Quality and Environment Consultancy

- **Legistex:** environmental legislation and standards applicable to the textile sector.
- **Environmental services:** to incorporate harmless environmental practices to their processes.
- **Toxic and hazardous waste minimisation plans:** to reduce sub-products and pollutants generated by a certain productive process.
- **Quality Managing System Implantation** to promote quality systems with the aim to improve their market competitiveness.
- **Technical Consultancy**
- **Verifications** of the different equipment

## Information and Communication Technologies

- **ICT Services:** to facilitate the integration of companies in the information and communication technologies, with services applied to intercommunication among the different parts of the textile chain.
- [www.textil.org](http://www.textil.org): This the Internet Advanced Services tool for the Spanish Textile Sector, comprising a corporative web, catalogues of products, virtual shopping in the company web, service for private orders with remote control and 3D virtual service in [www.trade.org](http://www.trade.org).

## Certifications

- **UV label:** for long-exposed-to-sunlight textiles.
- **Fine-TEX:** for indoor upholstery. Fine-TEX Yellow; general domestic use. Fine-TEX Blue; general public use.
- **Oeko-Tex 100 and Oeko-Tex 1000:** criteria and limit values to control the harmful substances in textiles.
- **PPEs:** labour protection gloves and clothing, including aprons and protection vests, according to the Community legislation 89/686/CEE.
- **Eco-Label:** ecological criteria for all types of textile articles and production process.

## Training

- **2 University Masters with access to PhD**
- **Occupational training**
- **Professional Specialisation Diplomas (P.S.D.):** in Textile Technology, in computerised Design and Pattern-Making, in computerised Design of Jacquard Fabrics.
- **Occupational courses:** Weaver in shed looms, Clothing-machinery operator, Pattern maker / Pattern grader, Holder and CAD Jacquard assistant..
- **Official Degree in Career:** Technician in Spinning and Weaving Production
- **Continuous training courses**

AITEX offers its services to the sector, implementing continual training activities in order to increase the technological know-how of active professionals and technicians:

- Attendance courses
- Customized courses
- Distance courses
- Conferences and seminars
- Apprenticeship distance training
- In-company training plans.

## Research Lines

Over the past year, AITEX has been focusing on the following main areas of research and technological innovation:

- Technical finishes.
- Biomaterials.
- Biotechnology.
- Thermal comfort and insulation.
- Development of new materials.
- Development of trend-based products.
- Domotics.
- Electrospinning.
- Energy and comfort.
- Management design.
- Total logistics.
- Nanotechnologies.
- Information systems and electronic business.
- Surface treatments.
- Electronic intelligent textiles.
- Intelligent and functional textiles.

## Experimental facilities

AITEX has the following Experimental Facilities:

- Fibre extrusion.
- Compounding.
- Air texturing
- Electrospinning.
- Plasma.
- Coatings and laminates.
- Hot melt.
- RFID technology demonstration centre for textile outlets.
- Artificial vision.
- Ballistics testing facility.
- Thermal comfort.
- Thermo-tex

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[www.aitex.es](http://www.aitex.es), [www.textil.org](http://www.textil.org), [www.observatoriortextil.com](http://www.observatoriortextil.com)

## PERSONALIA

### **Professor Aldo R. Boccaccini** (FAU)

- was elected Fellow of the American Ceramic Society and received the award at its 113th Annual Meeting on October 17, 2011 held in conjunction with the Materials Science & Technology 2011 Conference in Columbus, USA. He presented there 2 invited lectures.

- was co-organiser of the *Professor K. K. Chawla Honorary Symposium on Fibers, Foams and Composites: Science and Engineering*, held in the framework of the Columbus conference.

- was honoured with McMahan Lecture Award at Alfred University (USA) on 13th October 2011.

- was Topic Coordinator for Topic Area F: Materials for Healthcare Applications at the EUROMAT 2011 ([euromat2011.fems.eu](http://euromat2011.fems.eu)) conference, Montpellier, France, 12-15 September 2011. He presented the highlight lecture: "*The biological effect of ionic dissolution products from bioactive glasses*".

- was a keynote speaker at the BIOFOAMS 2011 ([www.biofoams2011.com](http://www.biofoams2011.com)) conference held in Capri, Italy, on 21-23 September 2011, with the lecture: "*Polymer Coated Bioactive Glass Foams: Toughened Scaffolds for Bone Tissue Engineering*".

**Professor's Jan Bonarski** (IMIM) presentation "*Material stress diagnostics by X-ray and acoustic techniques*" was distinguished at the 6<sup>th</sup> International Conference on Mechanical Stress Evaluation by Neutrons and Synchrotron Radiation MECA SENS VI 2011 (Hamburg, Sept. 2011) and was received as invited lecture there.

**Professor Josef Eberhardsteiner** (TUW) was awarded Honorary Doctorates of the Belarus University of Technology, Minsk, and the Sofia University of Technology, Bulgaria.

**Professor Christian Hellmich** (TUW) is the Chairman of the Ninth IASTED International Conference on Biomedical Engineering, to be held in Innsbruck, Austria, Feb 12-15, 2012.

### **Professor Giulio MAIER** (POLIMI) - has been



elected Fellow of the European Academy of Sciences (Liège) was awarded with the 2011 **Blaise Pascal Medal in Engineering**

*„In recognition of his outstanding scientific achievements in the field of Structural Mechanics and Engineering, and his seminal activities in the same discipline.*

*His major and most original research contributions are distributed over several different topics: mechanics of elastoplastic structures (shakedown, extremum properties of solutions, structural design optimization), nonassociative flow rules, symmetric Galerkin boundary element method, quasibrittle fracture mechanics, development of integrated computational and non-destructive experimental methods for structural diagnosis and parameter identification by inverse analysis, mechanics of composites and micro-systems, structural engineering problems (tension structures, offshore pipelines, concrete dams). Member of several National Academies (Italian: Lincei, dei XL; Foreign: Poland, Hungary, Russia (Eng.), USA (Eng.), Portugal, South Africa), and recipient of numerous prestigious awards, among which: Feltrinelli (Lincei), Koiter (ASME), Ritz-Galerkin (ECCOMAS), and three Honorary Doctoral Degrees. Giulio Maier is greatly appreciated in the Engineering Community for his particular capacity in dealing with application problems by using advanced and innovative scientific methods”.*

At the award ceremony held on November 11, 2011 at the Università degli Studi di Milano Prof. Maier gave the lecture "*From effects to causes: benefits of inverse analysis in structural engineering*"

- He was awarded with the "*Life-Time Achievements Medal*" at the International Conference on Computational & Experimental Engineering and Sciences (ICCES'11), Nanjing, China

- He has been elected Foreign Member of the Academy of Sciences of Portugal.

**Professor Bernhard Schrefler** (UNIPAD) is currently (October 2011 – February 2012) at the Methodist Hospital Research Institute in the Texas Medical Center in Houston, working on tumour growth modelling with a porous media mechanics approach and modelling of nanoparticle transport in diseased microvasculature.

## KMM-VIN Members (Institutions)

### CORE

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 (Centre for Electrochemical Technologies), Donostia/San Sebastián, Spain
5. **CISM Lab** Centro Internazionale di Scienze Meccaniche Spin-off, Udine, Italy
6. **CUT** Cracow University of Technology, Poland
7. **EMINATE** eminate Ltd, Nottingham, UK
8. **FGH** 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
9. **IOD** Foundry Research Institute, Cracow, Poland
10. **IMBAS** Institute of Mechanics, Bulgarian Academy of Sciences, Sophia, Bulgaria
11. **IMIM** Institute of Metallurgy and Materials Science, Polish Academy of Sciences, Cracow, Poland
12. **IMRSAS** Institute of Materials Research, Slovak Academy of Sciences, Kosice, Slovakia
13. **IMZ** Institute for Ferrous Metallurgy, Gliwice, Poland
14. **TECNALIA** Fundación Tecnalia, Donostia-San Sebastian, Spain
15. **IPPT** Institute of Fundamental Technological Research, Polish Academy of Sciences, Warsaw, Poland
16. **ITC** Instituto de Tecnología Cerámica - AICE, Castellón, Spain
17. **IPM** Institute of Physics of Materials, Brno, Czech Republic
18. **ITME** Institute of Electronic Materials Technology, Warsaw, Poland
19. **MCL** Werkstoff-Kompetenzzentrum-Leoben Forschungsgesellschaft m.b.H. (Materials Centre Leoben), Austria
20. **MERL** Materials Engineering Research Laboratory Ltd, Hitchin, Hertfordshire, UK
21. **ONERA** Office National d'Etudes et de Recherches Aéropatiales, Chatillon, France
22. **POLIMI** Politecnico di Milano, Italy
23. **POLITO** Politecnico di Torino, Italy
24. **R-TECH** Steinbeis Advanced Risk Technologies GmbH, Stuttgart, Germany
25. **TUD** Technische Universität Darmstadt, Germany
26. **TUW** Technische Universität Wien, Austria
27. **UH** University of Hertfordshire, Hatfield, Herts, UK
28. **UNIPAD** Università degli Studi di Padova, Italy
29. **UNIVPM** Università Politecnica delle Marche, Ancona, Italy
30. **WUT** Warsaw University of Technology, Poland

### ASSOCIATE

1. **ALENIA** Alenia Aeronautica S.P.A., Naples, Italy
2. **CRF** Centro Ricerche FIAT, Orbassano, Italy
3. **EMPA** Materials Science and Technology, Dübendorf, Switzerland
4. **EU-VRI** European Virtual Institute for Integrated Risk Management, Stuttgart, Germany
5. **Saar-Uni** Saarland University, Saarbrücken, Germany
6. **FAU** Friedrich-Alexander Universität Erlangen-Nürnberg, Germany
7. **VGTU** Vilnius Gediminas Technical University, Lithuania

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