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Expert Interview with **Ramón Torrecillas**
Coordinator IP NANOKER

Photo of this Newsletter



Title: Huygens
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HIGHLIGHTS

Deliverables regarding Milestone 2 were approved by the EC. Phase 2 of IP NANOKER has consequently started.

This Newsletter is also available on the IP NANOKER Website

Project Mission

IP NANOKER “**Structural Ceramic Nanocomposites for Top-end Functional Applications**” is a 4 year research project co-funded by the European Commission within the Sixth Framework Programme for Research and Technological Development.

The Industrial needs – The challenges of the project

The advanced materials – currently used in industry – do not meet the requirements demanded by many technological innovations which could provide major breakthroughs for our society. One of the main handicaps is that - up to now - it has been impossible to combine in the same material an excellent mechanical performance with the critical functionality necessary for its application.

For example, the biocompatibility required for the materials used for **structural implants** has restricted the number of suitable metallic materials to those such as alumina, zirconia and hydroxyapatite.



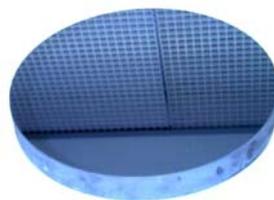
properties not provided by more resistant materials.

For advanced **optical applications**, such critical functionality would be transparency. Glass is brittle, its low

mechanical strength and hardness make it useless for applications such as aeronautics or high power lightning elements, yet is transparent. Due to their high refractoriness, ceramics could also meet the requirements of these types of systems, including transparency. Due to production problems, up to now this has only been possible using single crystals of limited size - and at an astronomic prize.

The design of new super-hard materials and nanostructured coatings is a current challenge.

Fabrication of coatings and free standing components from nano-sized particles involves relatively low-cost processes suitable for large and relatively complex shapes.



“New materials are requested for observation instrument mirrors. IP NANOKER helps us to develop them.”

Laurent Blanchard (Alcatel Alenia Space)

However, a complete understanding of the chemical and physical phenomena controlling the modulation of the material at nanometer scale is still lacking. For example, methods for the strict control of grain size during plasma/particle interactions and the subsequent solidification process, including the use of tailored composition precursors, still require extensive research. Synthesis of super-hard materials needs extreme conditions of high temperature and pressure.

Ceramics provide well known advantages for cutting tools. However, some of their intrinsic characteristics, such as their low thermal conductivity, limit the number of candidates to few very expensive ones.



Wear resistance, mechanical strength (tensile and especially edge strength) hardness and dense microstructure are the crucial requirements for **carbon based components** made for mechanical engineering and electronics (bearings, seals, micro contacts, switches, polar plates).

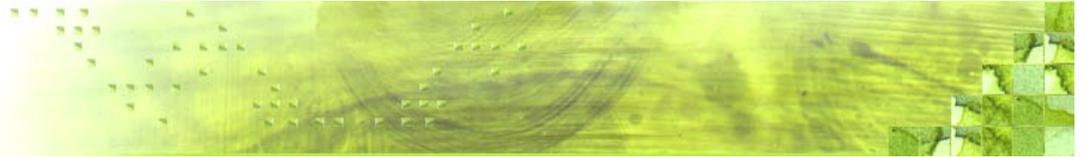
The tendency to miniaturize these components as well as the requirements for longer maintenance cycles have led to rising requirements (higher loads on smaller components over longer periods of time).

Mechanical resistance of actually used carbon based materials impose technical limits which cannot be overcome without a radical change in both raw material basis and shaping technology.

“High strength carbon material in near net shape is an old dream. IP NANOKER could make this dream come true.”

Thomas Metzinger (SGL Carbon)

A new research approach has to lead to better, faster and cheaper manufacturing of complex carbon parts with improved mechanical and structural properties, and shapes with improved dimensional tolerances.



Preparation

In summer 2003 an enthusiastic discussion regarding the necessity for research on new ceramic nanocomposites arose among various European companies and researchers. The INCAR belonging to the Spanish Council for Scientific Research (CSIC) assumed in its role as project coordinator the responsibility to present a proposal to the European Commission. After a successful first preparation stage, in May 2004 the project Consortium consisting of 25 partners discussed in Oviedo scientific breakthroughs and research approaches for the synthesis and processing of nanopowders.



IP NANOKER Preparation Meeting 18th May 2004 Oviedo (Spain)

After several meetings and intensive negotiations all contract documents were finally approved by the European Commission in April 2005 and the Commission Project Officer Dr. Millet could announce the 1st May as the start date of IP NANOKER.

Kick-Off

The Kick-Off-Meeting on 12th May 2005 at the Central Offices of the CSIC in Madrid was the first IP NANOKER event.

During two days all partners presented their organizations and specific contributions to this project. First research highlights were intensively discussed and the different project committees were set up.

Results to be expected for Industry

IP NANOKER carries out its research activities in specific fields of industrial application organized in 12 subprojects:

- Hip, knee and dental implants with life spans superior to the actual ones,
- Bone substitutes allowing the control of the cellular and tissue reaction adjacent to the implant through the introduction of biological stimulants as growth factors in order to promote the formation of osteogenic materials,
- Radiation windows for satellite guidance,
- Satellite mirrors with high stability and a surface roughness lower than 7 anstrom,
- Polycrystalline lasers of high efficiency,
- Components and nanostructured coatings for engines in aeronautics,
- Conductive nanoceramic materials which can be machined by EDM technologies
- Metal-ceramic materials of extreme hardness for cutting tools, and finally.
- High creep resistant nanostructured materials

The CSIC vice-president Prof. Montserrat Torné expressed her confidence that due to its participant structure IP NANOKER would obtain very relevant results for European companies generating high exploitation potentials for novel Nanomaterials.



IP NANOKER Kick-Off Meeting in Madrid

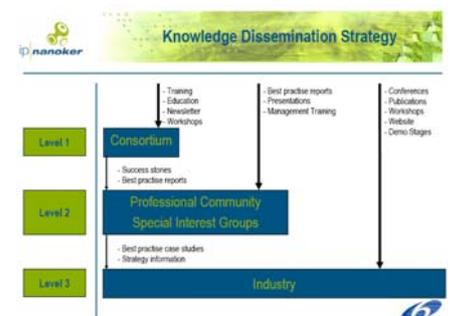
Parallel to this task, the subprojects focused on the elaboration of definitions of product and material requirements as requested in the Workpackage on **"Synthesis and Processing of Nanopowders"**.

Apart from the pure scientific tasks, innovation and dissemination related activities are crucial in a project like IP NANOKER with strong company participation and the aim of transfer of results to industry.

This is the reason why during the run of the project several reports on intellectual property rights, patents, and regulations checks studies will be released. First reports have already been submitted to the EC and are now available to all IP NANOKER partners.

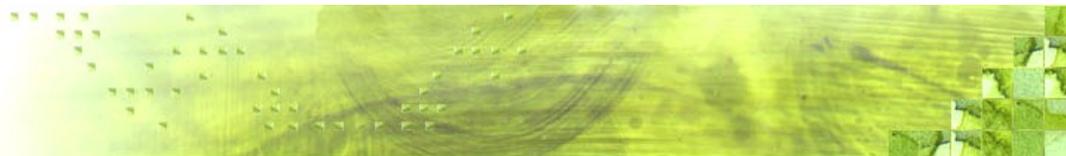
Actual & Future Activities

The first project months in 2005 were especially dedicated to the development of the relevant data for the baseline configuration data files (BCDF) of the 12 subprojects. The BCDFs establish the essential research route for the first 18 months and constitute the main result of the Workpackage on **"Materials, Process and Product Development Strategy"**.

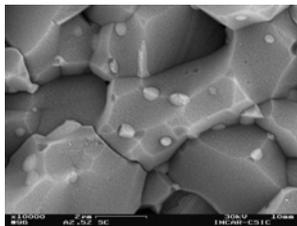


IP NANOKER CONSORTIUM





Apart from these support reports, which will be available to the partners during phases 2 and 3 of the project, during the next months a customized patents database will be available as further useful tool.



As far as training activities are concerned, two training workshops were carried out in October 2005 at the "Casa de Asturias" in Brussels. The first workshop focused on "**Management and Coordination**" and was especially dedicated to finance and reporting. Although all IP NANOKER partners have sound experience regarding the execution of European

projects, specific coordination tools as well as guidelines for the preparation of reports were very welcome.

During the second workshop on "**Health and Nanomaterials & Nanotechnologies**" the partners discussed with international experts and experts from the EC toxicological aspects of nanoparticles and responsible research on nanotechnology, security and health aspects in relation to nanomaterials. However, this training was not the only activity carried out within IP NANOKER regarding nanoparticles and their impact on human health. In fact, a literature overview on nanoparticle health issues has also been elaborated and is now available for project partners.

Another relevant event in 2005 was the joint workshop between IP NANOKER and NAMAMET in November. During this workshop of both the objectives and foreseen results of IP NANOKER and NAMAMET were presented.

The actual and future technologies for nanopowders production and for sintering were discussed and the properties of nanomaterials for future applications were outlined.



Joint Workshop:
IP NANOKER - NAMAMET
Brussels 28th November 2005

Expert Interview with Ramón Torrecillas - Coordinator IP NANOKER



In May 2005, the European integrated research project IP NANOKER officially started after nearly two years of preparation. What were the main stimuli for this project?



Dr. Ramón Torrecillas,
Head of Nanostructured Materials Group,
National Carbon Institute, Oviedo (Spain)

Dr. Torrecillas: Many new technological advances are limited by the impossibility to combine high mechanical performances of actually known ceramic materials with critical functional or structural material properties. "Nanocomposites" entirely made of ceramic and metallic nanoscale particles or nanoscale phases, is a new class of engineered materials where unique and otherwise unattainable properties can be revealed. In this context, industries and scientists involved in research on nanocomposites realized the necessity to jointly set-up a Europe-wide research project focused on nanostructured ceramics.

Why does this project deal with nanocomposites? Which needs would you point out?

Dr. Torrecillas: Nanocomposites present due to its nanostructure unique properties. Studies show that the use of biocompatible medical implants is restricted by its limited mechanical performance during operation; we also stated a lack of structural/functional transparent materials for advanced lightning technologies and new laser applications. Selective radiation windows for satellite guidance and aerospace devices operating under very severe environmental conditions are missing and stable structural and functional components for microdevices processed by micro-fabrication techniques have to be found. Finally, the life span is quite reduced.

Which are the relevant challenges of IP NANOKER?

Dr. Torrecillas: In order to obtain dense nanostructured materials the following challenges have to be faced: avoid nanopowder agglomeration and contamination, avoid grain coarsening and ultimate loss of the nanofeatures and to be able to fabricate large and dense parts.

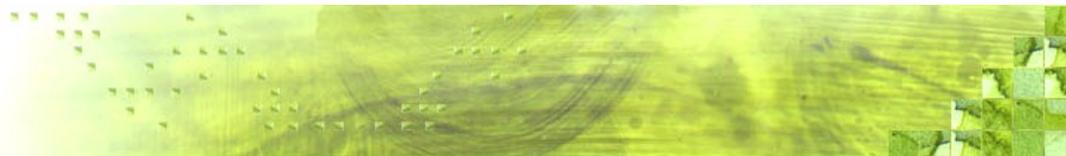
As we have seen in partner meetings this can only be achieved by taking into account the total added value chain on processing and manufacturing of nanomaterials and devices.

IP NANOKER is an integrated research project. What means integration for you?

Dr. Torrecillas: Integration means for us first of all the capacity of our consortium to establish both interdisciplinary and cross-sectorial work units to resolve common problems.

How did you achieve a complementary consortium?

Dr. Torrecillas: Since the idea for IP NANOKER arose, all efforts focused on a project consortium led-by-industry. For the different application fields of IP NANOKER we selected experts of companies and research organizations. Both are devoting their work to their individual area of expertise; each partner is part of a whole and overlapping could be avoided.



News from the EC

Simpler Rules for the Seventh Framework Programme

In December 2005 the European Commission adopted its proposal for the rules for participation in the Seventh Framework Programme. These Rules establish many of the improvements identified for the implementation of research while ensuring stability and continuity with the past. Many of the improvements relate to legal, procedural and financial aspects but the rules for protection, dissemination and use of the results are also enhanced.

European Technology Platform NANOMEDICINE

On 23rd November 2005 the first official meeting of this new European Technology Platform took place. Three key priorities have been confirmed by the stakeholders:

- Nanotechnology-based diagnostics including imaging
- Targeted drug delivery and release
- Regenerative medicine



European Technology Platform

Although during the meeting first members have already been proposed for the initial working groups, new members might be accepted after the opening of the platform in January 2006.

Relevant Links

[Nanotechnology website of the European Commission](#)



[Scientific Research and Technological Development in the European Union](#)

RESEARCH

Events & Highlights

IP NANOKER Consortium Council Meeting: The meeting will be celebrated at the Engineering Faculty of the University of Rome. **30th – 31st March 2006**

5th International Workshop on Biomedical Applications of Nanotechnology: **16th February 2006. Berlin (Germany)**

10th Seminar and Meeting on: Ceramics, Cells and Tissues Materials for scaffolding of biologically engineered systems: interface and interactions: **23rd May 2006. Faenza (Italy).**

For more information about IP NANOKER consult our website:

www.nanoker-society.org

FACTS & FIGURES

IP NANOKER is an Integrated Project co-funded by the European Commission under the NMP priority of the Sixth Framework Programme for Research and Technological Development.

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The IP NANOKER project consortium comprises **25 organizations** from 9 countries:

Consejo Superior de Investigaciones Científicas (Spain)

University of Science and Technology of Krakow (Poland)

Alcatel Space SA (France)

Avio SPA (Italy)

Cerámica Industrial Montgatina, SL (Spain)

Colorobbia Italia SPA (Italy)

Centre de Recherche des Industries de Fabrication (Belgium)

DGTec SAS (France)

Fundación en Asturias para la Investigación Científica Aplicada y la Tecnología (Spain)

Institut National des Sciences Appliquées de Lyon (France)

Consorzio Interuniversitario Nazionale per la Scienza e Tecnologia dei Materiali (Italy)

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FACT Systeme GmbH (Germany)

Nobel Biocare AB (Sweden)

Astursinter, SL (Spain)

Piaggio Aero Industries SPA (Italy)

Saint-Gobain C.R.E.E. SAS (France)

SGL Carbon GmbH (Germany)

Tespint, SA (Belgium)

University of Stockholm (Sweden)

Institute for Manufacturing Technologies of Ceramic Components and Composites, University of Stuttgart (Germany)

Institute of Materials Science, Tampere University of Technology (Finland)

Wright Medical Italy SRL (Italy)

Xenomedical LTD (United Kingdom)

Ecole Polytechnique Fédérale de Lausanne (Switzerland)