



# Nanotechnology for Chemical Enterprises

“How to link scientific knowledge to the business in the Central Europe space”

This project is implemented through the CENTRAL EUROPE Programme co-financed by the ERDF

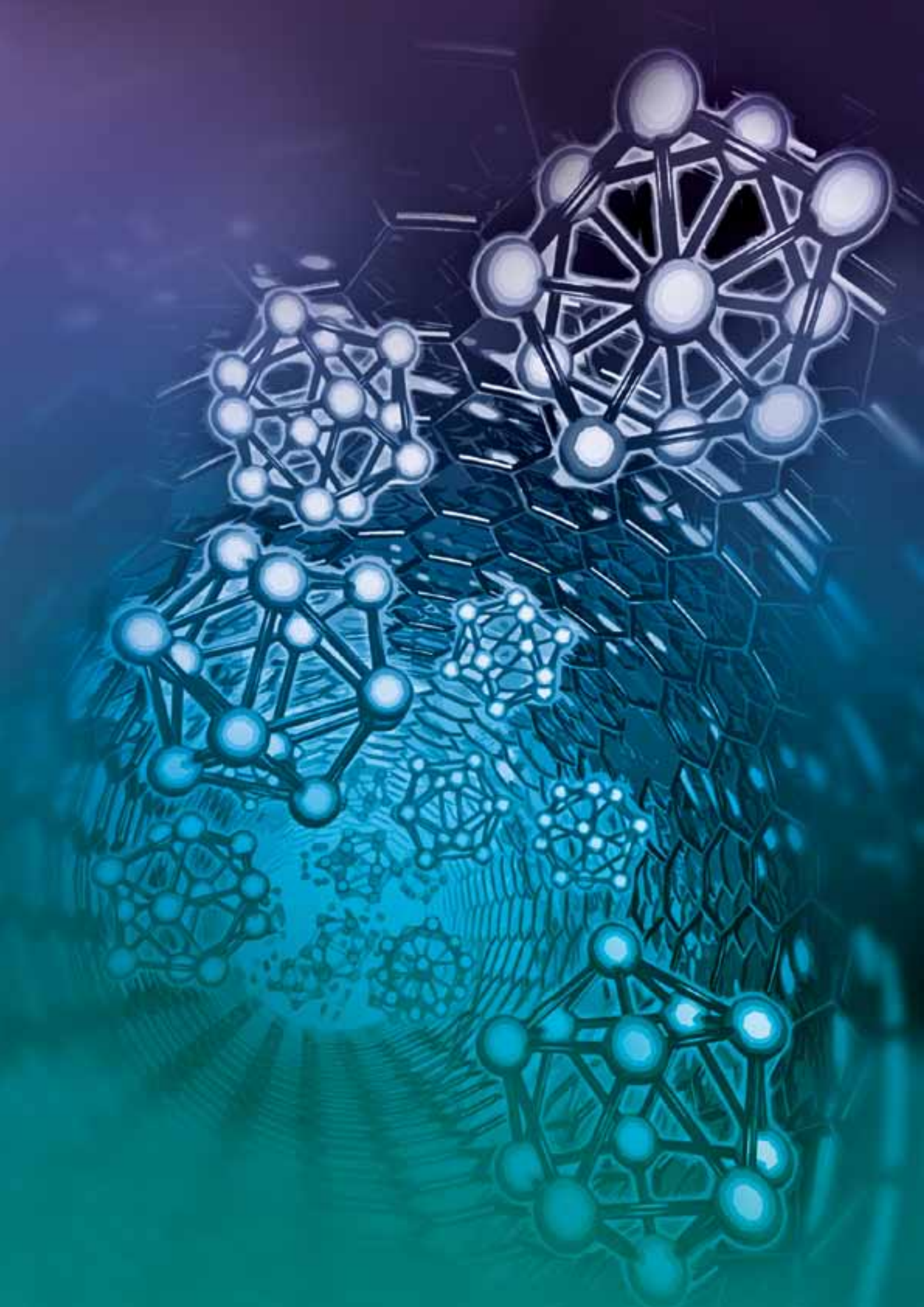


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# nano FORCE

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# 1. Introduction



## Project summary

Nanoscience and nanotechnology represents new approaches to research and development (R&D) that concern the study of phenomena and manipulation of materials at atomic, molecular and macromolecular scales. Nanotechnology currently underpins many practical applications (medical, ICT, energy production, food-water, security, a broad range of materials, etc.) and has the potential to enhance quality of life and environmental protection, and boost industrial competitiveness. The 30 months long NANOFORCE project started in May 2011. The project is performed in eight regions of the Central Europe belonging to seven countries. It has been developed by nine project partners, national & regional chemistry associations and R&D Centers in the Central Europe. The project is funded within European Territorial Cooperation Objective CENTRAL EUROPE Program, Application round 3.

## Project challenges

Even if knowledge in the field of nanosciences and its industrial application has been gradually increasing over the last 10 to 20 years in Europe, there is a need for greater international cooperation and research coordination to overcome disciplinary boundaries, to fill the gap between more and less experienced regions and to turn investments in R&D in to industrial innovations. This is a major challenge for the EU economies and for the regions of Central Europe.

## 2. Objectives & Methodology



### General project objective

In line with the EU Strategy for Nanotechnology (2004) and the EU Action Plan for Nanoscience & Nanotechnology (2009), the general objective of the NANOFORCE project is to foster the innovative nanotechnology sector networks across Central Europe regions by bringing together public and private organizations (enterprises, research centers, venture capitalists and public institutions) to carry out collaborative & interdisciplinary research projects on nanomaterials (in the frame of REACH Regulation) and to turn the most promising laboratory results into innovative industrial applications, not only to produce new materials, but also to improve industrial sustainability (more security & lower environmental impact in the product life cycles).

### Specific project objectives

According to Priority 1.1 and the strategy of expanding industrial-oriented research in the nanotechnology sector within the given Central Europe regions, the specific objectives of the NANOFORCE project are:

- 1) Recommendations for the European Commission to advance potential changes of REACH regulation for some specific nanomaterials according to the risk assessment carried out on selected nanomaterials
- 2) Identify up to 100 potential deals between R&D Centers and large and SM Enterprises of Central Europe to turn research into industrial processes
- 3) Specific development of (up to) 8 transnational businesses (e.g. joint ventures) after the end of the project that go through the industrial application of innovative nanoproducts
- 4) Nanotechnology roadmap for CE region composed by the Technological Rating and Business Plan
- 5) Design an I.N.V.C.F. – Interregional Nanotech Venture Capital Fund after the project completion.

## Specific project outputs

NANOFORCE project presents the way how to develop nanotechnologies in a sustainable way to researchers, managers, SMEs and public authorities:

- 1) White Book of recommendations for the European Commission to advance potential changes of REACH regulation for some specific nanomaterials according to the risk assessment carried out on the selected nanomaterials
- 2) NANODEALS GENERATOR – ICT platform to support the commercialization of research results in the Central Europe. It will allow young scientists with an entrepreneurial spirit to test their proposals, find potential partners and investors
- 3) Technology rating methodology – the new methodology for evaluation of deals in the nanotechnology sector
- 4) Business plan consisting of a detailed feasibility study and benefits and risk assessment. It will be created prior designing of an Interregional Nanotech Venture Capital Fund
- 5) International project publication issued at the end of the project, providing the technical description of project achievements.

## The approach and methodology

Implementation of a framework analysis is planned (baseline reports and SWOT) concerning the innovation level or gained experience in the nanotechnology sector of the chemical companies and governance authorities in the CE region. The information collected in this phase contributes to the delivering a report for the CE region, while the volume of information (including baseline reports for 7 countries) will enhance the database (available on the project website for public consultation). Once the market & research potential have been outlined for each region, LAB-analysis & exposure scenarios will be delivered on 3 major sets of nanomaterials (e.g. titanium dioxide, zinc-oxide) to investigate the potential health & environmental risks of nanoproducts to be commercialized and how they specifically fit in with the REACH Regulation.

## Nanotechnology guidelines

Indeed, acceptance of product and performance standards, as well as further science-based development of new products, depends on the development of sound measurement which supports product safety & quality. Inputs will lead to the development of transnational guidelines for the responsible use and production of nanomaterials that will subsequently be adapted at the local level by all PPs according to the main industrial attitudes of the NANOFORCE concerned regions. Local workshops with key-stakeholders are planned to enlarge the acceptance basis. Then, based on the LAB tests, recommendations will be mainstreamed to the European Commission with the aim of improving the implementation of current EU legislation & the regulatory approach towards nanotechnology in Europe.

## Nanotechnology platform

Subsequently NANOFORCE tackles the issue of fostering a cluster of innovation and industrial applications of nanotechnology across CE: the launch of the innovative ICT nanotechnology platform “Nanodeals Generator”, which will connect research with SMEs & the chemical industry (“knowledge to business” approach) to boost Nano R&D and “open innovation” among chemical nanotech companies. The “Nanodeals Generator” will operate throughout the project duration, and through this NANOFORCE expects to facilitate up to 100 innovative nanotech deals between enterprises and R&D centers of different countries. This intention is supported by a CE Nanotechnology Roadmap that provides tools to define and assess progress in nanotech & penetration into its mature phase of industrial development.

## 3. Relevance



### History of the project idea

At the end of 2006, Federchimica, the Italian Chemical Industry Association, launched the Programme named “NIC – Nanotechnologies in the Chemical Industry”. The aim has been to study the potential of nanotechnologies for the Downstream User Sectors, according to the EU’s societal needs. During 11 workshops and 3 national conferences in Italy, the first European network was established; the National Plans of 7 Member States (D, SF, F, B, NL, S, UK) were analyzed; 25 academic spin-offs and start-ups were identified and presented to the European Venture Capitalists Community (7 of them have become Partners of the Programme); a preliminary position paper was written on the risks and benefits of Nanotechnologies. Establishment of a stable Community with Central European Partners emerged as an opportunity to pursue in line with the EU Strategy for Nanotechnology (2004) and the EU Action Plan for Nanoscience & Nanotechnology (2009).

### Priorities and scope of intervention

In nanotech sectors, framework conditions aren’t set by public authorities at different levels. In particular, there are no specific laws on nanotechnology. Moreover, in all countries interested in the project, there is increasing concern regarding possible risks deriving from the application of nanotechnology in market products. This is mainly due to lack of, or poor information in the field. Thus, the NANOFORCE project – which is in line with Priority 1 of the Central Europe Programme – aims at bringing together public and private organizations to carry out collaborative & interdisciplinary research on nanomaterials and to create favorable technical and financial conditions to turn the most promising laboratory results into innovative industrial applications.

## International cooperation

National and regional policies and programs have an important place in funding nanotechnology R&D in Europe. It is recognized, however, that national capacities have often proven inadequate for the creation of world-class poles of excellence. There is an urgent need for these programs to be coordinated so that effort is consolidated and focused on ensuring a critical mass and greater impact on the three key synergetic axes: research, infrastructure and education. In order to stimulate the use of nanotechnology in applications and to increase and capitalize upon the interdisciplinary nature of nanotechnology R&D, it is important for national programs on chemistry & nanomaterials to be coordinated in a way that ensures critical mass in applied R&D, which combines various scientific competences, and boosts the financing of ventures.

**1. Technical level:** joint assessment of 3 major nanomaterials through LAB analysis to estimate how they specifically fit in with the REACH Regulation.

**2. Networking level:** the project promotes dialogue between the main chemical associations of Central Europe and Countries and address better governance, codes of practices, safety & regulation applications under the REACH Regulation, joint capacity building to gather market-oriented research and educational exchange programs.

**3. Market level:** tools provided by NANOFORCE, such as the common B2B (Business to Business) platform (nanodealgenerator) & the transnational technological rating, support the supply and demand match-making between enterprises and companies of the partners' regions towards achieving the objective of 100 deals and 8 effective nanotech businesses.

**4. Financing level:** one transnational business plan to create an Interregional Nanotech Venture Capital Fund to finance innovative ideas with nanomaterials will be delivered.





## 4. Sustainability & Knowledge Management



### Sustainability of the project achievements

The convergence of nanotechnology with biotechnology, information technology & cognitive sciences increases opportunities for industrial innovation. It also raises important issues relating to safety, health security, environmental impacts & respect for EU Regulations related to nanotechnology materials. Project, following an analysis of 3 major nanomaterials & the profile of performance/standards, will provide the European Commission valuable information in relation to potential changes in the regulation of some specific nanomaterials, in view of the update/ review of REACH Regulation scheduled for 2012. This, if adopted by EC, will result in newly addressed rules for the EU chemical sector, with subsequent benefits not only for the CE chemical companies, but for the whole EU chemical/ nanotech market segment.

### Transferability of the project results

NANOFORCE will gather transnational cooperation in the CE area to answer to the need of concentrating resources & assure access to knowledge beyond the local scale. Additionally, the transferability of the transnational venture capital funds could be supported by establishing connections with other public or private investors outside the cooperation areas (e.g. the most active countries in the nanotech R&D), or by intercepting the European Investment Funds after circulating the NANOFORCE business plan for the VC at the European Bank of Investments. Further potential for the transferability of the project results could be developed by linking the “knowledge to business” approach run by NANOFORCE with the EU Framework Programs (FP) and CIP, with the aim of strengthening the role of nanotechnologies research with respect to business application & enhancing the territorial capital of the European Regions. The results of the examined nanomaterials and scenarios must be finally translated into commercially viable products and processes. NANOFORCE, with its support for the B2B platform contributes to a favorable environment for innovation of the enterprises in the concerned project areas.

All major project results (outputs) of NANOFORCE will be freely available to the general public via the project website.

## Knowledge management

Progress in nanotechnology depends on a skilled workforce and interdisciplinary approaches as well as research infrastructure based on appropriate technology transfer mechanisms & schemes in order to progress towards industrial application and innovation. One of the main assumptions of the NANOFORCE project concerns the effective capacity to gather nanotech knowledge (investing in human resources) and contribute to transferring the applied research to industry (knowledge to business approach). The knowledge management strategy of the project, which is part of the general project mainstreaming strategy, will be implemented and undertaken by all project partners according to the following criteria:

1. Overcoming disciplinary boundaries by making universities and R&D centers closer in the LAB analysis with the aim of supporting science integration and avoid duplication and fragmentation of the field-research
2. Giving fuel to the entrepreneurial mindset, by facilitating the creation of "poles of excellence" in Central Europe along with other forms of academic-industry collaborations, such as the course planned in WP6 to assist students & researchers in start-up/ spin-off of nanotech innovative business
3. Attracting young people to nanotechnologies (through addressed publications and info-days planned in the WP2) with the aim of encouraging the young generation to engage in the discussion about R&D, and by presenting it as a career option with many opportunities. This aspect is extremely important because nanotechnology, despite being a fundamental knowledge, remains a niche technology. The NANOFORCE project contributes to bridging this gap and gives to students an ideal opportunity for gaining "hands-on" experience into this branch of R&D, as outlined by the Lisbon and EU 2020 commitments.

## Target groups

**1) Companies operating in the nanotechnology sector:** Large companies & SMEs need a tool to access relevant info on R&D and the most promising ideas in the field of nanotechnology to exploit potential markets.

**2) Researchers:** Need to organize a coordinated approach to nanotech research in Central Europe and to more effectively transfer the applied research to industry.

**3) Venture capitalists:** Banks & venture capitalists assurances when offering risk capital to areas that are perceived to have a high technical risk, uncertain time-to-market or could have negative ethical, health or environmental consequences like nanotechnologies.

**4) Industrial and Chemical Associations and National Authorities:** Need to assess the effects on human health, exposure and environmental impacts of nanomaterials before industrialization/commercialization in order to profile common standards in terms of safety & quality of products.

**5) European Commission, the European Parliament and the Economic and Social Committee:** Need to reassess nanomaterials with respect to the review of REACH Regulation in 2011.

## Stakeholders and key players

**20 Industrial, Chemical and other competent Authorities and Associations:** • will benefit from new guidelines to manage nanomaterials and transfer such info to the SMEs in the regions involved in NANOFORCE

**3 European Commission, European Parliament and Economic and Social Committee:** • will receive a White Book of recommendations to advance potential changes of EU regulation for some specific nanomaterials

**100 Researchers:** • coordinate nanotech research in CE, effectively transfer applied research to industry; support entrepreneurial mindset of researcher to connect R&D to market

**25 Venture Capitalists:** • Banks & venture capitalists will receive all information necessary to assess positively nanodeals for funding

**100 Corporate nanotechnology sector:** • tool to access relevant info R&D most promising ideas of nanotechnology, exploit potential markets, create synergies and joint ventures

## 5. Work Plan & Activities



### Work package 0

**Project preparation**

### Work package 1

**Project management and coordination**

### Work package 2

**Communication, knowledge management and dissemination**

### Work package 3

**Existing nanotechnology infrastructures and strategy to reduce knowledge gaps in Central Europe**

- The realization of a framework analysis carried out by all project partners concerning the innovation level and experience in the nanotechnology sector of the chemical companies and governance authorities at the national and regional level in order to outline the current situation of the nanotechnology in the chemical industry in the Central Europe region.
- The CE framework review will be completed with an in-depth review of funding opportunities available at a regional, national and European level
- Collected data will be uploaded on to a database available on the project website.

## Work package 4

### How to foster the responsible use of nanotech and manage associated risks

- Provide concrete and empiric verified information on applications of nanotechnology with regard to the public health, safety, consumer and environmental protection (in the context of the REACH Reg. and national legislations).
- The WP foresees as a first step the review of existing safety procedures and related legislation in nanotech research at the EU (REACH) and National level, regarding the evaluation of nanomaterials in their use and production to achieve an actual framework of regulations currently applied in the CE area.
- The following activity is dedicated to the specific toxicological analysis of nanosubstances (at least 3) to evaluate their registration in the context of REACH Registration and to investigate their potential for health & environmental hazards.
- The Safety Data Sheets and specific exposure scenarios will be elaborated to provide all safety concerns and toxicological data concerning potential risks linked to applications of nanotechnology.
- Data obtained through in-depth risk assessments will constitute a basis for elaboration of the transnational guideline on nanotech responsible management successively adapted for local stakeholders.
- Those concerns will be also forwarded to the European Commission in form of the Book of Recommendations useful for the planned revision of the REACH Regulation in 2012.

## Work package 5

### Supporting Nano R&D commercialization & industrialization

- The project intends to implement innovative actions in the nanotech sector and to foster collaborations between research and industry. The Lead Partner will develop an innovative ICT nanotechnology platform, named "Nanodeals Generator", which will operate throughout the duration of the project.

- This instrument will connect research and knowledge generating institutions with the chemical industry (research to business) and will provide expertise tailored to individual needs along with support for innovative SMEs in launching new joint nanotechnology initiatives ("nanodeals").

- Once the platform is developed, the partners will commence support for the business to business (B2B) actions for enterprises.

- In this phase, the partners will carry out dissemination actions, in order to involve a great number of subjects, in the industrial or scientific sphere.

- The project estimates to facilitate up to 100 innovative deals in the nanotechnology sector, between companies and R&D centers in different countries and/or regions.

- The 100 deals registered in the "Nanodeals Generator" will be evaluated through a Technology Rating Methodology.

- This roadmap composed of TRM and the Business Plan of proposed INVC Fund provides the technical & financial means to define and assess progress in nanotech along with penetration into its mature phase of industrial development.

## Work package 6

### "Interregional Nanotech Venture Capital Fund" & Capacity Building

- Creation of an Interregional Nanotech Venture Capital Fund (I.N.V.C.F.) will be a strategic tool for the acceleration of the deal flow proposals:

- I.N.V.C.F. will be proposed as a project follow-up for fundraising to the international Venture Capitalists operating in the participating regions. It will be a specific proposal to provide funding to the identified nanotech initiatives.

- I.N.V.C.F. will enable better integration of the Venture Capitalists during the phases of scouting, identification, pre-analysis and evaluation of the nanodeals. It will create a common culture on investments towards innovative initiatives.

- I.N.V.C.F. will be based on the development of the pertinent Business Plan consisting of detailed SWOT analysis and feasibility study, benefits and risk assessment as well as detailed description of the functions and prospective effectiveness.

## 6. The Partnership



### Relevance of chosen partnership

The NANOFORCE project lasts for 30 months and covers 8 regions of Central Europe belonging to 7 Countries. It has been developed by national & regional chemistry associations and R&D Centers of the Central Europe area, as the key players in boosting innovation for their associated enterprises, and this represents a crucial asset in the achievement and ownership of expected project results. Project Partners (PP) are the key players in the concerned CE regions. They represent national chemistry associations – the most qualified to run the LAB analysis and design scenarios for nanomaterials. Furthermore, in Europe (overall in the Central Europe area) most of the chemical companies involved in the nanotech sector are SMEs. The composition of the partnership with Chemical Associations and Research Centers is the important key for achievement of the results of this project.

### Project partners profiles

**Lead Partner**  
**SC – Sviluppo Chimica spa**



SC Sviluppo Chimica S.p.A. is a service company fully owned by Federchimica, the Italian Federation of Chemical Industry, and pursues the strengthening of the sector providing a broad range of professional advice aimed at improving its overall competitiveness and fostering territory development while cooperating with public institutions and their agencies promoting investment attraction. Sviluppo Chimica SC provides professional advice on funding research and development, deploys innovation, management consulting, training, logistics, product and plant safety, environment and finance, both public (grants) and private (Venture and Development Capital Funds).

**Project Partner 2**  
**Veneto Nanotech S.C.p.A.**



The Cluster for Nanotechnologies was created in the Veneto Region in 2002, exploiting the technical and scientific skills available in the local Academia and production network. Its successful implementation in this region was enhanced by the numerous real application opportunities and the nation's highest number of per capita businesses, which translates into a high concentration of industries potentially interested in applying nanotechnology. Veneto Nanotech was created with the aim to foster transferability of nanotechnology research products to innovative and high-tech companies, and to support the development of startups in the focus sector. Veneto Nanotech is also active in the formation of young and talented researchers, in the organization of dissemination activities and courses for entrepreneurs and companies' staff in order to demonstrate the potential applications of nanotech. Veneto Nanotech is involved in several national and European working groups and funded projects, focused on advancing the knowledge base and management of risk assessment of nanotechnology and also coordinates the activities of the Hi-Tech Cluster of Nanotechnology applied to materials. It acts as a mediator at institutional level for enterprises and research centers interested in creating new products with high technology content. A major part of Veneto Nanotech's mission is dedicated to supporting R&D activities, to strengthen the existing infrastructure and to leverage the present regional competences as well as foster new international networks in order to boost the nanotechnology development also at the European level.

**Project Partner 3**  
**Association of Chemical Industry of the Czech Republic**



Association of Chemical Industry of the Czech Republic was founded in 1992 as a voluntary association of manufacturing, commercial, designing, research and advisory organizations with a relationship to chemical, pharmaceutical, petrochemical, and rubber and plastics industries. The association supports business interests of member companies in the Czech Republic, involvement of the Czech chemical industry in European and world economic systems, representing its companies in discussions and negotiations with authorities and handing over all available economic, legislative and technical information to its member companies. The Association deals with employment, social, wages and occupational safety issues. It also participates in collective bargaining with trade unions and in discussions with government authorities.

In the Czech Republic, the Association closely cooperates with the Association of Industry and Transport organizations associating companies operating in different fields of the chemical industry. The Association of Chemical Industry of the Czech Republic is a member of the Conseil Européen des Fédérations de l'Industrie Chimique (CEFIC), a member of the European Association of Employers in Chemical Industry and a member of the Fédération Européen du Commerce Chimique (FECC).

The Association fully supports the Responsible Care Program. Adhering to sustainable development, the Program fully respects principles of environmentally-friendly business and the involvement of the companies in the Program has a positive international reputation.

#### **Project Partner 4** **Chemistry Cluster Bavaria**



Chemie-Cluster Bayern has been established as an international project development platform for Bavarian companies and research institutes, regardless of their number of employees or size. Chemie-Cluster Bayern is designed as a contact and competence network for Chemical Assisted Living, i.e. for all areas in which chemical products take a sustainable contribution to improve quality of daily life. This covers, for example, areas of e-mobility, renewable energy, CO<sub>2</sub> prevention, new materials, but also building chemistry and polymer chemistry as well as chemical climate protection. Chemie-Cluster Bayern is, in particular, open to those participants who only have a peripheral involvement in chemistry and chemical products yet – often, chemical innovations provide the crucial progress.

Our joint objective is to create networks which promote cooperation, innovation and development of new product systems and services. Due to a closer link age of business and science, we also create a strong commitment to the region of Bavaria, thus creating a positive effect on the regional value added and jobs. In addition to mediating contacts to potential project partners, the team of Chemie-Cluster Bayern supports its members during the project – for instance, already at the start of the search for possible project support from federal or EU funds.”

#### **Project Partner 5** **Polish Chamber of Chemical Industry – PIPC**



The Polish Chamber of Chemical Industry is the organization representing chemical companies in relation to domestic and foreign government and non-government organizations. PIPC is the only Polish organization being a member of CEFIC and is authorized to represent the chemical industry on the international forum. According to its Statute, the Chamber is authorized to present its opinions on all regulations as regards functioning of the chemical industry in Poland. The Chamber receives in relation to of such regulations from the Ministry of Economy, Ministry of Environment and committee for the European Integration and others. The Polish Chamber of Chemical Industry was established in 1988 as a voluntary, nonprofit association of chemical companies in Poland. The Chamber associated numerous major manufacturing and trade companies, scientific-research institutes and others, as well as branch associations. According to the Statute, activities of the Chamber are focused on: better competitiveness of the chemical industry in Poland; sustainable development of the chemical branch; “Responsible Care” implementation; health, environment and safety issues; positions on draft legal acts (at the national and EU level) on behalf of the chemical industry; cooperation with international organizations (CEFIC and ECEG) branch organizations (FE, IFA, EUROCHLOR); promotion of the chemical industry within society to improve its image.

**Project Partner 6**  
**University of Nova Gorica**



The Laboratory for Environmental Research (Laboratorijzaraziskave v okolju, LRO) is an interdisciplinary research unit established in 1995. From its earliest years it is tightly connected with the study programmes at the School of Environmental Sciences, for continuous transfer of research outcomes and expert knowledge to students. The Laboratory has an international reputation based on its quality achievements and its commitment in applying research skills to current environmental issues. LRO hosts a growing number of national and international research projects. It values collaborative initiatives and joint action on a number of environmental aspects. It hosts various thematic areas that together contribute to the interdisciplinary character of this research unit. The Laboratory for Environmental Research participates actively in fundamental as well as applied research. In the area of fundamental research, the activities of the laboratory are directed to the investigation of photochemical and microbial degradation as well as the transport of pollutants in the environment, the development of laser-based methods, bioanalytical methods, and ecotoxicological tests for the identification and determination of toxic compounds and their effects on the environment, the development of new materials for their application in environmentally friendly technologies, and investigations in molecular biology and neurobiology. In the field of applied research we also investigate the possibilities of applying the photothermal and bioanalytical techniques to control the quality and safety of food.

**Project Partner 7**  
**BioNanoNetForschungs GmbH**



The BioNanoNet GmbH is an Austrian Network organization which provides convenient access via a single contact partner to a broad range of proven scientific expertise covering numerous disciplines of medical and pharmaceutical research. By connecting leading companies, universities and non-university research organizations, we have created a broad technology platform with the aim of driving innovative interdisciplinary research. The BioNanoNet GmbH also develops and coordinates interdisciplinary research and contract research projects in close cooperation with its partners. By providing a single portal enabling potential customers from the pharmaceutical industry to quickly and efficiently find reliable partners with the required expertise from amongst our network partners, BioNanoNet GmbH simplifies the process of establishing collaborations and enhancing the likelihood of a successful outcome. The other principle role of BioNanoNet GmbH is to initiate and subsequently coordinate national and international research projects at different stages of the pharmaceutical value chain.



#### **Project Partner 8**

#### **Association of Chemical & Pharmaceutical Industry of the Slovak Republic**



The Association of Chemical and Pharmaceutical Industry of the Slovak Republic was established as a voluntary association of business entities in the Slovak chemistry and pharmacy industry on 30 November 1991. Currently it represents 53 member entities, which employ more than 12,000 workers. Its activities are aimed at: defending the commercial and business interests of the chemical and pharmaceutical industry in dialogue with the parliament and government of the Slovak Republic, with central union, interest groups, national and international governmental and non-business; support of its member entities, in particular through developing an information service; coordination of activities and processes to solve common problems; promoting the interests of Slovak chemistry in the implementation of REACH; promoting REACH for professional public; submitting opinions and proposals to guide and influence development plans, and Slovak economic policy; development of trade policy to minimize and eliminate technical barriers; continuous improvement and expansion of cooperation with foreign partner associations and as a regular member of the European Chemical Council CEFIC influence the legislative process; deepening social dialogue with unions on working conditions, wages and other social care staff, particularly in the higher-level collective agreements; steadily deepening expansion of environmental care in particular through the Responsible Care, the DINS project and a number of other specific activities; deepening cooperation with electronic and other media in order to gain broad public support for further development of the Slovak chemical and pharmaceutical industries.

#### **Project Partner 9**

#### **Institute of High Pressure Physics, Polish Academy of Sciences**



The Institute of High Pressure Physics (IHPP) was founded in 1972 by the Polish Academy of Sciences. The present field of research activities covers ceramics, HTc superconductor's with biological materials (high-pressure studies of protein folding, and high pressure food processing) and the plasticity of metals (hydroextrusion) as well as nanotechnology. For more than 20 years, Unipress' scientists have worked intensively on the physics and technology of GaN and related semiconductors. This research led to the creation of a unique technology of high-pressure growth of GaN crystals with a dislocation density much lower than crystals grown at atmospheric pressure. This has paved the way for construction of blue/violet laser diodes by using crystals as substrates for growing epitaxial structures of (AlGaIn)N with exceptional structural and optical quality. Both the MBE and MOCVD nitride technology has been developed at UNIPRESS together with the laser-processing lab. The work on blue/ violet laser diodes has been done within the Polish Government program titled "The development of the blue opto electronics", which was coordinated by Unipress. In order to commercialize this technology, a new hi-tech focused company was founded. Nanotechnology is a keyword of a modern physics and material sciences. Unipress is involved in nano-studies not only by exploring classical low-dimensional systems like quantum wells and quantum dots, but also by working intensively on materials composed of nanograins such as nanoceramics and nanopowders. High-pressure technology plays a very important role in the process of sintering of nanopowders, enabling better control of grain size and uniformity, thus leading to the creation of a new generation of advanced materials.

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## NANOFORCE Central Europe partnership map



[www.nanoforceproject.eu](http://www.nanoforceproject.eu)

This project is implemented through the  
CENTRAL EUROPE Programme co-financed by the ERDF

