European Cooperation in Science and Technology
- COST -

Secretariat

Brussels, 9 June 2011

COST 4118/11

MEMORANDUM OF UNDERSTANDING

Subject :	Memorandum of Understanding for the implementation of a European Concerted Research Action designated as COST Action CM1101**:** Colloidal Aspects of Nanoscience for Innovative Processes and Materials

Delegations will find attached the Memorandum of Understanding for COST Action CM1101 as approved by the COST Committee of Senior Officials (CSO) at its 182nd meeting on 17 May 2011.

MEMORANDUM OF UNDERSTANDING

For the implementation of a European Concerted Research Action designated as

COST Action CM1101

COLLOIDAL ASPECTS OF NANOSCIENCE FOR INNOVATIVE PROCESSES AND MATERIALS

The Parties to this Memorandum of Understanding, declaring their common intention to participate in the concerted Action referred to above and described in the technical Annex to the Memorandum, have reached the following understanding:

1. The Action will be carried out in accordance with the provisions of document COST 4154/11 Rules and Procedures for Implementing COST Actions, or in any new document amending or replacing it, the contents of which the Parties are fully aware of.

2. The main objective of the Action is to provide a platform for cooperation and coordination in the European colloid-science domain directed towards development of innovative materials and processes.

3. The economic dimension of the activities carried out under the Action has been estimated, on the basis of information available during the planning of the Action, at EUR 112 million in 2011 prices.

4. The Memorandum of Understanding will take effect on being accepted by at least five Parties.

5. The Memorandum of Understanding will remain in force for a period of 4 years, calculated from the date of the first meeting of the Management Committee, unless the duration of the Action is modified according to the provisions of Chapter IV of the document referred to in Point 1 above.

A. ABSTRACT AND KEYWORDS

Colloid chemistry is a steadily growing field of immense importance. The enormous diversity of the colloidal processes involved in novel materials and their applications in both advanced technologies and everyday life cannot be overstated. There is a compelling need for exchange, coordination and cooperation in the European colloid community. This Action will combine coherently the outstanding European expertise in this field, including: theoretical modelling and experimental formation of functional and patterned interfaces; self-assembly of molecules and colloidal particles; synthesis and up-scaling of novel nano-colloidal and bio-colloidal materials; the kinetic and catalytic aspects of these novel materials; and their applications in chemical, pharmaceutical and food industries, as well as in nano-devices such as sensors, assays, photonics and bio-fuel cells. This includes many of the Grand Challenges in energy, health and environmental protection. The Action will provide a platform for coordination of national programs and will stimulate academia-industry cooperation. The Action's main deliverables will be the increased networking in colloid chemistry through the organization of scientific events (conferences, workshops), Training Schools and STSMs. Through an extensive mobility program targeted to early-stage researchers, it will encourage their involvement in the research at the international level.

Keywords: colloids, interfaces, nanoparticles, nanostructures, interactions

B. BACKGROUND

B.1 General background

Colloid and interface science is dealing with multi-phase systems, in which one or more phases are dispersed in a continuous phase of different composition or state. The colloid science is particularly relevant to the "nanoworld" as the objects investigated have at least one dimension falling in the range between 1 and 1000 nm. The dispersed phases may consist of solid particles, liquid droplets and gas bubbles as well as thin films intervening between them. This scientific field has experienced a steady growth in Europe and globally. This is related to the enormous diversity of

colloidal systems and processes, and their ubiquity and broad applicability in both advanced technologies and everyday life. In fact, colloid and interface science had been dealing with nanoscale objects for almost a century before the term ‘nanotechnology’ was coined. The vast accumulated knowledge in the field represents a firm basis for further development of nanoscience and its applications in innovative engineering processes and materials for advanced technologies, as well as products for the life sciences domain. However, the challenge for a better understanding of the behaviour of many complex colloid systems and processes still remains. The role of this COST Action is to contribute to the development of the European colloid and interface science by integration and combination of the research potential of highly qualified and specialised teams working in the COST countries and in some non-COST institutions. The COST Framework provides the appropriate and, indeed, ideal instrument for a large scale cooperation of various scientific institutions, including universities, academic research institutes and industrial R&D centres.

For our project, a major benefit from networking within COST will be the synergistic effect from bringing together teams of various expertise: analytical methods and synthetic approaches; fundamental science and industrial applications; theoretical reasoning, computer modelling and state-of-the-art experimental techniques, as well as stimulating new ideas and cultivating future collaboration through interactions between scientific schools in colloid science with different styles and traditions.

This COST Action aims at setting up proper international and intercultural environment for defining and solving new challenging scientific problems and for bridging the gap between fundamental and applied research in order to meet the Grand Challenges like energy issues (photonics, bio-fuel cells, sensors), health (medicine, pharmaceutical and food products) or environment via the development of nanoscience based novel functional materials and innovative processes.

B.2 Current state of knowledge

Colloid science is interdisciplinary in nature – it bridges between our macroscopic world and atoms and molecules. It appeared on the frontier of science after the fundamental studies by Einstein on the Brownian motion (1905) and Perrin on the determination of the Avogadro number and Boltzmann constant (1908), which led to the acceptance of the molecular theory by the scientific community. A cornerstone of colloid chemistry is the theory of interactions and stability of colloids developed by Derjaguin, Landau, Verwey and Overbeek (DLVO) in 1941–1948. A strong boost of colloid and interface science was observed after the 1980's with the growing interest in nanoscience. During the last decade, the number of publications in the ten most popular colloid journals is steadily increasing and the mean impact factor of these journals has grown from 2.43 in 2001 to 3.65 in 2009. There are at least three reasons behind this development.
Firstly, the interest in nanoscience and nanotechnology has led to both fundamental and applied studies on advanced (electronic, photonic, composite, etc.) materials for the technologies of the future.

Secondly, it has been recognized that colloid and interface science is important for the understanding of processes in living organisms, most of which happen at the surfaces of biological cells and intracellural structures, relevant to bio-medical applications such as immuno-tests and assays, bioinspired materials, etc.

Thirdly, the colloid and interface science has an enormous potential for applications in the development of products used in industry and everyday life. Indeed, the colloidal systems are extremely diverse, including aerosols, hydrosols (suspensions, pastes and glues), emulsions, foams, porous materials (filtration membranes, sorbents, catalysts, isolation materials), some alloys, minerals and coloured glasses. Many systems in chemical, pharmaceutical and petroleum industries are colloidal, as well as numerous personal-care and household products, such as laundry powders, shampoos, hair conditioners and paints, tooth pastes, creams, etc. Another large field of application is food industry, insofar as the properties and longevity of various food products (mayonnaises, milks, cheese, margarines, vines, beer, etc.) is determined by the properties of thin films stabilized by lipids and proteins. The common feature between all these quite different micro-heterogeneous systems is the existence of a large area of intrinsic interfaces.

In summary, the colloidal and interface science represents not only an inexhaustible research field, rich and diverse in interesting phenomena, but it has also a vast potential for applications in both everyday life and advanced technologies. It is necessary to stress that since the beginning of colloid science, Europe has played a leading role in its development. Recently nanoscience and nanotechnology have been identified as the objectives of priority areas of EU Framework Programs, ERA-NET calls and national programs. This Action can be regarded as an enabling and thus a necessary networking platform for cooperation and coordination of activities of highly qualified research teams from COST countries and non-COST institutions working in this field.

B.3 Reasons for the Action

The major challenge is to achieve a synergistic effect from the incorporation of European expertise in colloid science into vigorous streams of ideas and methods pertinent to nanomaterials and nanotechnologies. Some of the processes occurring at the nanoscale are still poorly understood, and thus significant scientific challenges remain to be tackled before further progress can be made. The demand for rapid and timely progress in this area requires a further pan-European platform for scientific cooperation, coordination and exchange, which would also stimulate interactions with researchers from countries further afield including Australia, China, India, Russia and Ukraine. The mission of this COST Action is to facilitate such a platform. This COST Action will benefit from direct access to the outcomes and capacities gained in the Action D43 Colloid and Interface Chemistry for Nanotechnology (2006–2011). The Action will cooperate with the European Colloid and Interface Society (ECIS), which traditionally organizes its conferences. Therefore, there is definitely a unique and indispensable role for the new COST Action in the field of colloid chemistry. It will reflect continued development and novel trends and directions, leading to significant scientific/technological advance. The COST Action will have a strong societal role in attracting younger researchers. Involving them in the high level scientific activities in the international community could be regarded as a decisive step towards their future careers.

B.4 Complementarity with other research programmes

The research on various aspects of nanoscale systems has become the objective of the FP7's key thematic area "Nanosciences, nanotechnologies, materials and new production technologies". The main emphasis has been given to studying phenomena and to manipulating matter at the nanoscale in order to develop nanotechnologies leading to the manufacturing of new products and services as well as using the knowledge of nanotechnologies and biotechnologies for new products and processes. Therefore, there is a number of ongoing research projects, which are thematically linked to the Action. All of them are focused on the investigation of specific nanosystems and their applications. Three examples for such FP7 projects are following.

The project "Multi-scale modelling of nano-structured polymeric materials: from chemistry to materials performance" (NANOMODEL) aims at development of multi-scale methods to compute the mechanical, thermochemical and flow behaviour of nano-filled polymeric materials. The project "Nanoengineered Nanoparticles and Quantum Dots for Sensor and Machinery Applications" (NANOSENSOMACH) is dedicated to the synthesis, characterization and assembly of nanoparticles, quantum dots and hybrid nanostructures with tailored functionalities. The project "Peptide-Based Nanoparticles as Ocular Drug Delivery Vehicles" (PANOPTES) focuses on the development of methodology for the manufacture of novel peptide-based nano-particles and nano-capsules for sustained drug delivery.

In comparison to this COST Action, all these projects are thematically more focused and specific. On the one hand, such projects could fund, at least in part, the work of the COST participants on specific research tasks, and could direct their investigations on important subjects with potential practical applications. On the other hand, the COST Action can provide a platform for discussion and dissemination of their results.

At present, there is no other COST Action in the domain of colloid and surface chemistry. The Action TD1003 Bio-inspired nanotechnologies: from concepts to applications is specifically focused on the bio-inspired nanosystems and nanomaterials. Measures will be taken to avoid overlap with its activities. In the Materials, Physics and Nanosciences (MPNS) COST Domain the Action MP0901 Designing Novel Materials for Nanodevices - from Theory to Practice (NanoTP) does not consider the colloidal aspects of nanomaterials.

Most of the national research councils offer programmes of similar topics. These programmes are also more focused on particular problems. Since this COST Action is broader, it has an umbrella function of bringing together national activities in a loosely packed manner, facilitating freedom for the different scientific cultures and generating a strong synergy.

C. OBJECTIVES AND BENEFITS

C.1 Aim

The aim of the Action is to provide a platform for cooperation and coordination in the European colloid-science domain directed towards development of innovative materials and processes.

C.2 Objectives

The objectives are defined by the scope of the research activities and the objectives of the six Working Groups (WGs) of the Action:

1. Development of new theoretical approaches and novel analytical methods for monitoring and characterization of transfer of amphiphilic molecules at interfaces with application to complex processes of aggregates assembly/disassembly, delivery and removal of specified molecules for the purpose of chemical functionalization of nano- or microparticles or formation of nanostructured surface layers.

2. Formulation of new theoretical and analytical approaches to the modelling of phenomena at the frontier of quantum, nano- and micro-scales in order to establish new routes of creation of novel two- and three-dimensional assemblies, supra-particles, and hierarchical structures, with an emphasis on revealing the driving forces and main factors.

3. Development of novel, reproducible, economic and up-scalable methods of obtaining various colloidal materials, such as nano-, core-shell and microgel particles (inorganic and organic), hybrid, bio-colloidal and biomimetic materials as well as solid surfaces with well-defined roughness and functionalities.

4. Identification of new routes to designing and characterizing non-equilibrium interfacial processes, including mass, charge and heat transport phenomena in colloids and at surfaces with applications for formation of self-assembly of aggregates, mono- and multilayers, and hierarchical structures with application in electrocatalysis; photocatalysis, enzymatic reactions and bioelectrochemistry.

5. Application of the acquired knowledge for solving problems in relation to the development of better colloid-based products such as shampoos, hair and skin conditioners, food products as well as carriers of drugs and vaccines with optimized release properties.

6. Engineering of chemical processes and analytical techniques for the design of colloid-based devices at micro and nano-level, as sensors and assays with applications in medicine, electronics or energy harvesting.

C.3 How networking within the Action will yield the objectives?

The Action would be a realization of the idea for ERA in the field of colloid chemistry. The COST instruments will be implemented and are expected to work efficiently:

- annual meetings of the WGs to review their specific activities and results

- annual Action's Training School with advanced lectures, which will aim to attract ESRs from Europe and around the world
- at least 10 STSMs per year, and at least 70% of them for ESRs
- creation of international research teams within the WGs, facilitated by STSMs, which will use state-of-the-art equipment for their research activities
- exchange of information between the Action members by e-mail, dedicated web page or society network portal
- annual workshop, which will gather representatives of all participating teams and renowned experts from Europe and around the world
- dissemination of the results coordinated by the Chair, WG coordinators and MC members through established scientific communication channels, such as publications, websites, oral or poster communications at conferences, and seminars at universities, research institutions and industrial laboratories

C.4 Potential impact of the Action

The main benefit stemming from the Action will be the increased networking in colloid chemistry through the organization of scientific events, which will engender new ideas and inspire joint scientific studies and publications in this interdisciplinary research field and will provide new technological solutions concerning application of nanoscience. This would contribute to the realization of the idea for ERA in the field of colloid chemistry.

The Action will add value to the national programmes on nanotechnologies existing in most European countries. Knowledge-based economy, considered as an antidote for the current economical crisis, creates a need for qualified personnel in chemical, pharmaceutical, biotechnical and medical sectors. The Action will provide new opportunities for the personal development of ESRs, fostering their participation in the colloid science community. Thus, it will contribute substantially to the further development of nanotechnology, to the increase of its share in the European economy, thus making it more competitive globally. At the European level, the Action will assemble the existing expertise in colloid and interface chemistry and will promote partnerships between academia and industry, thereby further enhancing Europe’s reputation in science and technology. It will form the base for new European proposals on more focused problems (e.g. RTN-Marie Curie, FP Cooperation projects, etc.).

C.5 Target groups/end users

The target group of the Action is primarily the European community of colloid and interface scientists. The priority group will be Early Stage Researchers (ESR) who will participate in the Training Schools and workshops of the Action and the STSMs.

Second target group will be the industrial partners of the Action. Their participation will create a strong link between fundamental and applied research and will ensure an industrial impact of the Action. The industrial partners involved in the research activities will also directly benefit from the Action by direct access to the developed technologies of formation of new nanoscale materials and introduction of innovative processes.

D. SCIENTIFIC PROGRAMME

D.1 Scientific focus

As mentioned above, this Action will coherently combine the European expertise in colloid and interface chemistry, including theoretical modelling and experimental research, in order to understand, control and tailor colloidal systems. The Action includes six major topics, each of them being represented by an individual Working Group (WG). They correspond to the six basic subdomains of colloid and interface chemistry: (i) interfaces; (ii) colloidal interactions; (iii) synthesis of colloids; (iv) kinetics of colloidal processes; (v) products; and (vi) devices. The subjects of Working Groups 1 and 2 are related to fundamental aspects of interfaces and colloids related to molecular processes at interfaces; self-assembly and multi-particle interactions in colloids and theoretical modelling of such systems and processes. Working Groups 3 and 4 will be focusing on chemical processes: synthesis of nanoparticles and other nano-colloidal materials, as well as on the respective kinetic and catalytic aspects. Finally, the activities of Working Groups 5 and 6 will be dedicated to applications for development of colloid-based products and devices. A more detailed description is below.

D.2 Scientific work plan - methods and means

The scientific work plan for each Working Group, including the methods and means are as follows.

WG1. Interfacial phenomena – fundamentals, modelling and analytical methods

Working Group 1 will carry out new experimental and theoretical studies on interfacial processes and phenomena. This includes transfer and adsorption of amphiphilic molecules at interfaces, which could happen under different kinetic regimes (diffusion, barrier, mixed or oscillatory) and can be accompanied by disintegration of self-assembled structures such as surfactant micelles and protein aggregates, and can serve as a mean to deliver target molecules at functional interfaces. Both fluid and solid interfaces will be investigated, including nanoparticles of chemically functionalized surfaces. The phase transitions in monolayers or multilayers of adsorbed molecules will be investigated in relation to the formation of interfaces (membranes) of special mechanical and chemical properties. Analytical methods for monitoring and characterization of interfaces will be developed and applied. The interfacial properties govern the forces between two particles and the collective behaviour of colloidal dispersions, so that the results of WG1 (single interface) will have a direct applicability in WG2 (forces between two interfaces, multibody interactions and self-assembly), WG4 (kinetics and catalysis at interfaces), and WG5 (foams, emulsions and suspensions in applications).

WG2. Self-assembly and colloidal interactions: from specific to long-range

The work plan of WG2 includes novel aspects of the colloidal interactions and their role for the creation of self-assembled and supra-molecular structures. Surface forces that are beyond the conventional DLVO theory will be investigated, such as the hydration repulsion, hydrophobic attraction, structural force, and specific key-lock interactions, which affect many systems and phenomena, but are still incompletely understood. Another class of interesting phenomena includes the interactions (due to capillary, electric or magnetic forces) between colloid particles attached to interfaces or confined in liquid films in relation to their importance for obtaining two-dimensional particle arrays and nano-structured interfaces (the bottom-up approach). The three-dimensional assemblies, supra-particles, gels and hierarchical structures represent another vast research field.

For example, thermo- and pH- responsive gels with various potential applications (e.g. microsensors for toxic compounds) will be created and investigated. New theoretical and analytical approaches will be developed for modelling the phenomena at the frontier of quantum, nano- and micro-scales. This will help for the understanding and control of various processes of practical importance.

WG3. Synthesis of nano- and bio-colloidal materials: development and up-scaling

This Working Group will develop novel and up-scalable methods and synthetic approaches for obtaining various colloidal materials, such as nanoparticles of potential applications in electronics, photonics, drug delivery, etc. Different synthesis routes, like nano-precipitation, water-in-oil and oil-in-water microemulsion reaction methods will be applied and compared. This includes production of uniform inorganic and organic nanoparticles (e.g. metals, oxides and latexes) with well-defined shapes and morphology. Moreover, composite core-shell and multilayered particles of different chemical compositions and potential applications will be synthesised and their properties will be examined. Sol-gel synthesis methods will be used to create electrochemical materials with designed chemistry, microstructure and potential applications for batteries, capacitors, etc. Another interest of this group will be bio-colloidal, biomimetic and bio-hybrid materials, in which desired biomolecules are encapsulated within sol-gel derived inorganic matrices. Another important class of materials includes solid surfaces with well-defined roughness and functionality. In particular surface properties and functionality may benefit nanotechnology based coatings. In solar cells such coatings may improve their efficiency and prevent contamination of the surface. In the case of wind mills the coating may prevent corrosion and reduce friction. In membranes for fuel cells and for biofuel production, clogging and biofilm formation are a major problem for the functionality of these systems.

WG4. Kinetic and catalytic aspects of nano-colloids and nano-structured surfaces

The teams participating in WG4 will work on the challenging topics of non-equilibrium processes, including mass, charge and heat transport phenomena in colloids and at interfaces. One of the research directions is electrocatalysis, which represents enhancement of electrochemical reaction rates by surface modifications of various kinds at the electrochemical active surface and which is an important research issue in the context of energy conversion and storage. Another promising field is the photocatalysis, which is the acceleration of a photoreaction in the presence of a catalyst with diverse applications for removal and destruction of organic contaminants, conversion of molecules, etc. Nanoparticulate dopants (gold or silver) have proved to be effective in increasing the efficiency and selectivity of catalytic reactions. Enzymatic reactions that happen at interfaces will be also examined in the context of biomedical applications, e.g. understanding the physical chemistry of digestion, or in relation to personal care products, such as washing powders, where the blockage of the enzymatic activity by surfactants must be overcome. Other important topics are the kinetics of growth of nanoparticles obtained by different synthetic routes and the kinetics of self-assembly of aggregates, mono- and multilayers, and hierarchical structures.

WG5. Processes and materials for everyday life and biomedical applications

The Group members will have the mission to apply fundamental knowledge to solving problems of direct practical importance in relation to the development of better colloid-based products. These include the products for personal care (shampoos, hair and skin conditioners, shaving foams, sun protection creams, etc.) and house-hold detergency (powders for laundry; formulations for dish-washing, cleaning, etc.). The control of their properties, such as foamability, stability, dispersability, skin- and eye-irritation action, etc. is based on the knowledge of competitive adsorption of various species; drainage and stability of liquid films; action of defoamers, de-emulsifiers and additives such as perfumes and solid particles; equilibrium and kinetics of micellization, solubilization, crystallization and other processes. The quest for improving the quality of food products, such as cheese, mayonnaises, ice-creams, etc., is a source of many challenging tasks for colloid scientists, because these systems are complex blends of solid particles, oil drops and gas bubbles.

To understand them, the whole repertoire of colloid science should be mobilized. A large class of problems is related to the stabilization of colloidal dispersions in various applications, e.g. for phase-change materials in energy storage and for particles that are used as carriers of drugs and vaccines. The cooperation of researchers from academia and industry will help the dissemination and application of the results.

WG6. Colloid-based devices: sensors, assays, photonics and micro-fluidics

This Working Group will engineer colloid-based devices. Such are the immunosensors and immunoassays that measure the presence and/or concentration of a given substance based on the interactions within an antigen/antibody pair and production of a measurable signal in response to a specific binding. Another class of devices includes nano-electronic and photonic elements, such as nanocapacitors and photonic cells, with linear or non-linear electronic and plasmonic properties. Energy harvesting devices, such as solar cells, can utilise antireflective coatings from colloidal arrays that strongly reduce the energy losses due to light reflection. A vast research field represents the lab-on-a-chip and micro-fluidic devices that are used for designing chemical processes and analytical techniques at micro and nano-levels. Special attention will be paid to a new class of devices, the biofuel cells, which convert the chemical energy of a fuel (e.g. glucose) and oxidant (e.g. oxygen) directly to electrical energy by utilizing enzymes to catalyze oxidation and reduction reactions based on the nanoarchitecture of elements immobilized in a sol-gel matrix.

E. ORGANISATION

E.1 Coordination and organisation

The organisation of the Action will follow general features common to all COST Actions. The Management Committee (MC) will coordinate and approve the activities of individual Working Groups (WG) and integrate them to reach the overall objective of the Action, and report to the Domain Committee for Chemistry and Molecular Sciences and Technologies and the COST Office.

The MC will approve the budget. The Chair, Vice-Chair and Grant Holder will coordinate the Action's organization and finances. The scientific reports for each event will be timely delivered to the COST Office. The 6 WG Leaders will provide periodic reports on the scientific activities to the MC, and they will be combined them into single report for the Domain Committee. The Action's problems and achievements will be presented at the Annual Progress Conference organized by the CMST Domain.

Short-term Scientific Missions (STSM) will be used as an instrument to promote collaboration between the participating laboratories; early-stage researchers will be the main target group for the missions. STSMs will have a dedicated coordinator.

The milestones of the Action are annual meetings of all WGs and progress reports. The coordination of the national research will be implemented at the WG level, with the formation of dedicated research teams, proposing the STSMs, organization of workshops and Training Schools.

The Management Committee will guarantee effective communication among the Action participants.

1. The MC will maintain a website and encourage other means of electronic communication, (such as electronic mail, social network portals, e.g. Facebook, or externally editable websites). The Action website will be regularly updated by the Action webmaster and will contain information about the work-plan, past and future conferences and workshops, completed STSMs, progress reports, list of publications of the Action.

2. The MC will organise conferences, workshops and Training Schools to encourage the exchange of know-how between the Action participants.

3. The annual COST workshop will be connected to the ECIS conference to give the opportunity for a broader view of current results.

E.2 Working Groups

The highly interdisciplinary field of the colloid and interface science requires the creation of six Working Groups. First two: WG1-“Interfacial phenomena – fundamentals, modelling and analytical methods” and WG2 “Self-assembly and colloidal interactions: from specific to long-range” will concentrate on the fundamental aspects providing (with the feedback) the new knowledge for activities of other WGs developing innovative materials and processes. WG3 “Synthesis of nano- and bio-colloidal materials: development and up-scaling” and WG4 “Kinetic and catalytic aspects of nano-colloids and nano-structured surfaces” will inspire research of and provide solutions for the last two WGs, WG5 “Colloidal processes and materials for everyday-life and biomedical applications” and WG 6 “Colloid-based devices: sensors, assays, photonics and micro-fluidics”. The last two WGs will be engaged in more applied research with the direct involvement of industrial partners. Therefore, WGs 5 and 6 will represent the Action’s interface between academia and industry.

Each Working Group will be managed by a WG Leader who will coordinate its activities, be responsible for the organisation of workshops and Training Schools and encourage cooperation between WGs. He/she will be responsible for the timely delivery of periodic reports of WG's activities to the MC Chair. The organization of the WGs will be as flexible as possible and the trans-WG activities will be encouraged. Each WG will meet once per year to focus on its specific subjects.

The annual milestones of each workgroup are reports on their activities at the annual meetings of the Action, which all Working Groups will be participating in. This meeting will be the main platform for the WGs to coordinate their activities, collaborations and exchange. Moreover, the Working Groups will also define their research focus and detailed work plans.

E.3 Liaison and interaction with other research programmes

It is reasonable to assume that some of the potential network members already participate in the consortia taking part in other COST Actions or other European and international research programmes. They will serve as the most natural liaisons and the sources of information about on-going activities. Members of other programmes will also participate in the Action workshops, especially those organized in parallel with the annual conferences of the European Colloid and Interface Society. In particular MC members of the Actions TD1003 Bio-inspired nanotechnologies: from concepts to applications will be invited to present the scope of their Action and to exchange the information in order to avoid the overlap of research activities. Links with the projects in the area of risk assessment of the impact of nanoparticulate systems on health and environment will also be established.

E.4 Gender balance and involvement of early-stage researchers

This COST Action will respect an appropriate gender balance in all its activities and the Management Committee will place this as a standard item on all its MC agendas. The Action will also be committed to considerably involve early-stage researchers. This item will also be placed as a standard item on all MC agendas. Efforts will be made to ensure equal representation of men and women at all Action levels (Chair or Vice-Chair, WG Leaders, MC and WG members), reimbursed meeting participants, trainers and trainees at schools. This goal is realistic because the number of female researchers in the field of colloid chemistry is relatively high. Early-stage researchers will be preferred for STSMs with the minimal share 70%. They will also be the target audience of the COST Training Schools, which will be organized every year.

F. TIMETABLE

The Action will last for 4 years. That time will allow smooth absorption of new members by the already existing network of the Action D43, definition of WG's priorities and establishing contacts with industrial partners, whose participation is vital for the goals of Working Groups 5–6. The timetable of the Action is summarized below.

Time	Activities					
Year 1	Kick-off meeting and Workshop					
	WG1	WG2	WG3	WG4	WG5	WG6
	WG meetings, Training School and STSMs					
	COST Workshop + MC meeting					
	Year 1 reporting					
Year 2	WG meetings, Training School and STSMs					
	Mid-term Conference + MC meeting					
	Year 2 reporting					
Year 3	WG meetings, Training School and STSMs					
	COST Workshop + MC meeting					
	Year 3 reporting					
Year 4	WG meetings, Training School and STSMs					
	Final Conference + MC meeting					
	Final Report					

All Working Groups will be established at the kick-off meeting of the Action and WG Leaders will be nominated. All WGs remain active until the end. The milestones of the Action are annual meetings of all the Working Groups and progress reports. Annual meetings will be the main platform for the WGs to coordinate their activities, collaborations and exchange. Moreover, the WGs will also define their precise research focus and detailed work plans. In order to increase the cooperation between different Working Groups, also joint WG meetings will be held. In the last year, a final report on the results of the Action will be prepared and the final conference will be organised.

G. ECONOMIC DIMENSION

The following COST countries have actively participated in the preparation of the Action or otherwise indicated their interest: AT, BG, CH, CY, CZ, DE, EL, ES, FI, FR, HR, HU, IE, IL, IT, LT, LV, NL, NO, PL, PT, RO, RS, SE, SI, SK, TR, UK. On the basis of national estimates, the economic dimension of the activities to be carried out under the Action has been estimated at 112 Million € for the total duration of the Action. This estimate is valid under the assumption that all the countries mentioned above but no other countries will participate in the Action. Any departure from this will change the total cost accordingly.

H. DISSEMINATION PLAN

H.1 Who?

The target audience for the dissemination of the results of the Action is primarily the colloid and interfaces scientific community around the globe. Industrial partners will be involved in the activities of WGs 5 and 6. Standards Bodies will be contacted depending on the Action needs and activities, which may result in development of standardized procedures. The policy makers and the general public will be also informed about the Action activities by non-technical articles, dedicated websites, in newspapers and stands at science fairs.