



Project no. **INCO-CT-2005-016696**

Project acronym: **NANOPHEN**

Project title: **NANOSCALE PHENOMENA AND STRUCTURES IN
BULK AND SURFACE PHASES**

Instrument: **SSA**

Thematic Priority: **NMP**

D 19: Final Report to the European Commission

Period covered: **from May 01, 2005 to April 30, 2008**

Date of preparation: **June 12, 2008**

Start date of the project: **May 01, 2005**

Duration: **36 months**

Project coordinator name: **Assoc. Prof. Elena Mileva, DSc**

Project coordinator organisation name: **Institute of Physical Chemistry
Bulgarian Academy of Sciences
(IPC-BAS)**

Revision: **draft**



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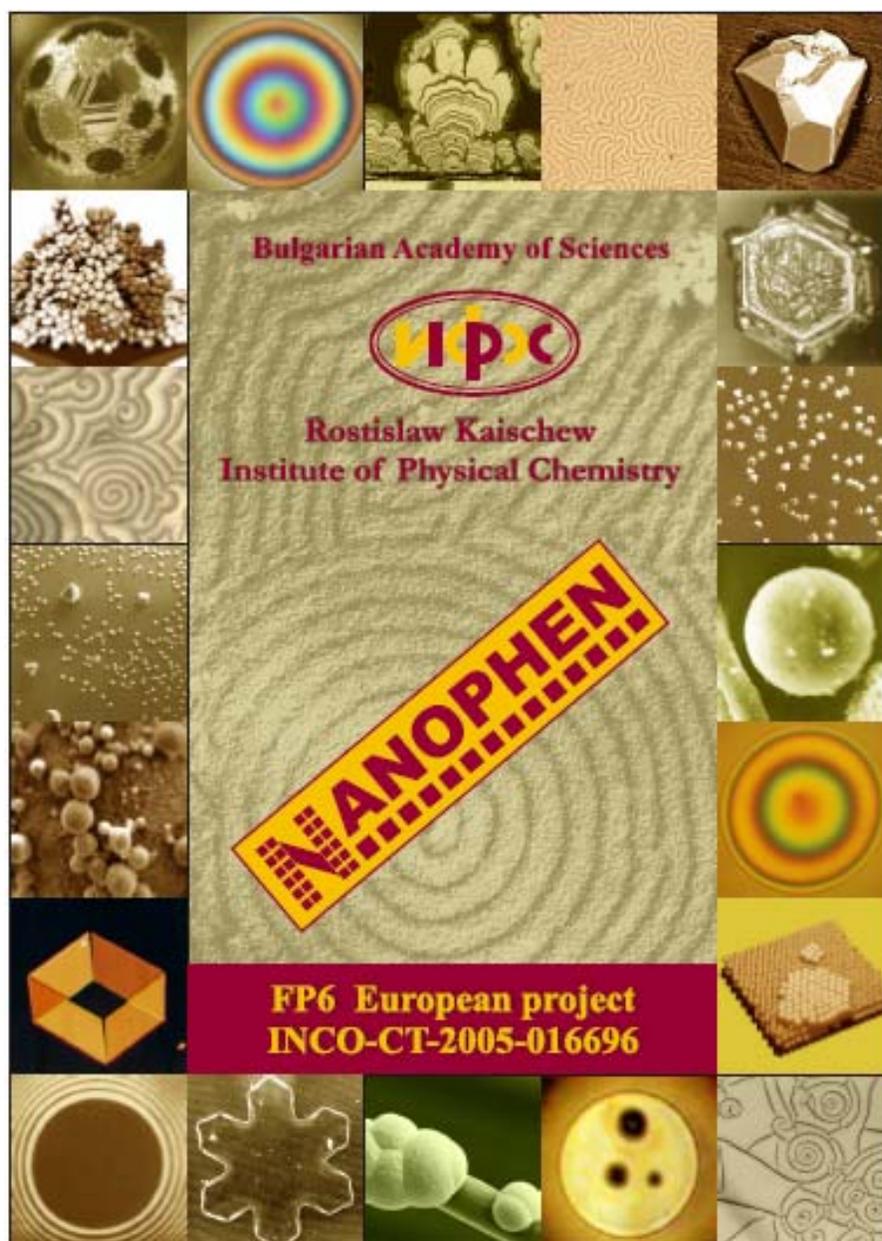
Project coordinator name: **Assoc. Prof. Elena Mileva, DSc**

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PUBLISHABLE EXECUTIVE SUMMARY

**NANOSCALE PHENOMENA AND STRUCTURES IN BULK AND
SURFACE PHASES
NANOPHEN
INCO-CT-2005-16696**

In **2005** Institute of Physical Chemistry at the Bulgarian Academy of Sciences (IPC-BAS) was selected as **European Center of Excellence “Nanoscale Phenomena and Structures in Bulk and Surface Phases” (NANOPHEN)** and got a considerable financial support by FP6 project **INCO-CT-2005-016696**.



The **NANOPHEN** project implemented by Institute of Physical Chemistry at the Bulgarian Academy of Sciences (IPC-BAS) was advanced in response to a specific FP6 call: “Promotion of co-operation with Associated Candidate Countries: Reinforcement of the Associated Candidate Countries’ Research Capacities” (FP6-2004-ACC-SSA-2) targeted especially at Rumania, Bulgaria and Turkey. The call was related to the EU program of “Integrating and Strengthening the European Research Area”. The aim was to identify poles of scientific excellence in these countries, whose research activity is related to one of the basic priorities of FP6. The basic characteristics of these poles had to be (i) respectable history of scientific achievements; (ii) present state-of-the-art related to high level of research activities and availability of excellent researchers. The basic idea was that the presence of these features guarantees the most efficient stabilization of such institutions and the European support will guarantee an immense impulse to their progressive development in the next 5 - 10 years ensuring the effective integration in structure of the European Research Area.

The analysis of the state-of-the-art of Institute of Physical Chemistry by the moment of the project preparation has shown the following:

- IPC-BAS has very good achievements in the field of nanosciences, nanotechnologies and new materials and processes (NMP), and in particular in the trends of: (i) nucleation and growth of crystalline and amorphous materials; (ii) interfacial phenomena in colloidal systems; (iii) knowledge-based multifunctional nanomaterials with direct industrial application;
- IPC-BAS has unique and original experimental instrumentation (for the investigation of surface forces at liquid interfaces, for the studying the initial stages of electrocrystallisation and crystallisation of proteins, etc.)
- IPC-BAS has a group of eminent senior research scientists.

Three major problems have been identified:

- a constant lack of adequate funding of research activities;
- although IPC-BAS has had diverse scientific instrumentation, most of the setups had not been renovated in the past 18-20 years and have been morally and physically outdated;
- a strong tendency of “brain-drain” and age-misbalance has persistently developed, exhausting the human potential of the Institute.

Therefore, the basic aim of the project was to target these major issues.

Starting off this state-of-the-art, the **strategic objective of the project NANOPHEN** was to **improve and reinforce the research capacity of the Institute of Physical Chemistry at the Bulgarian Academy of Sciences** in the field of nanoscale phenomena in bulk and surface phases so as to foster the impact of nanotechnologies on the national scientific and economic development.

The project aimed at:

- enhanced **collaboration** with similar MS institutions and formation of stable **networks**
- improving the **participation in ERA** and particularly in FPs initiatives

- formation of a **critical mass of highly qualified young researchers** with multidisciplinary scientific skills
- improving the **technical level of key scientific equipment** in IPC-BAS and thus enlarging the scope and efficiency of experimental techniques, which are widely used incl. for collaborative research with MS partner laboratories

The objectives were achieved by:

- enhanced exchange of scientists and expertise through **research visits** at leading European institutions in the field and **invitation of European expert scientists**;
- organisation of international scientific events: three **International Workshops**, two **International Experts Meetings** and one **International Conference**;
- creating new job opportunities and better working conditions
- intensive practical training for young researchers based on the organization and implementation of a unique **Pilot Program for coupled multidisciplinary training** and fundamental knowledge on nanoscale phenomena;
- upgrade of key scientific equipment in IPC-BAS

The support actions implemented **within NANOPHEN** resulted in:

- increasing the quality and scope of IPC-BAS research activities in the field of NMP
- adding new value to the national scientific potential in the thematic priority of the NANOPHEN project
- opposing the negative trend of age-misbalance in science and “brain-drain” of Bulgarian young researchers and increase of their competence
- elaborating a new concept for coupling multidisciplinary practical training and fundamental knowledge in the field of nanoscale phenomena and structures
- increased visibility of IPC-BAS scientific activities at the European level, intensified networking and increased participation in the national and European competitive funding programs.

The basic result of the implemented actions is that Institute of Physical Chemistry at Bulgarian Academy of Sciences has moved significantly to the point of conversion into **a high-level European research and advanced-training Center in the field of Nanoscience and Nanostructured Materials.**

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Key moments in the NANOPHEN activities

(i) Organization and implementation of a unique **Pilot Program for coupled multidisciplinary training** and fundamental knowledge on nanoscale phenomena




 ROSTISLAW KAISHEV INSTITUTE OF PHYSICAL CHEMISTRY
 BULGARIAN ACADEMY OF SCIENCES

POSTER SESSION

APRIL 21, 2007
 "BOTZMANN" HALL, IPC-BAS, 15:30-17:30

**PILOT PROGRAM
 FOR COUPLED MULTIDISCIPLINARY TRAINING AND
 FUNDAMENTAL KNOWLEDGE ON NANOSCALE PHENOMENA**

TOPICS:

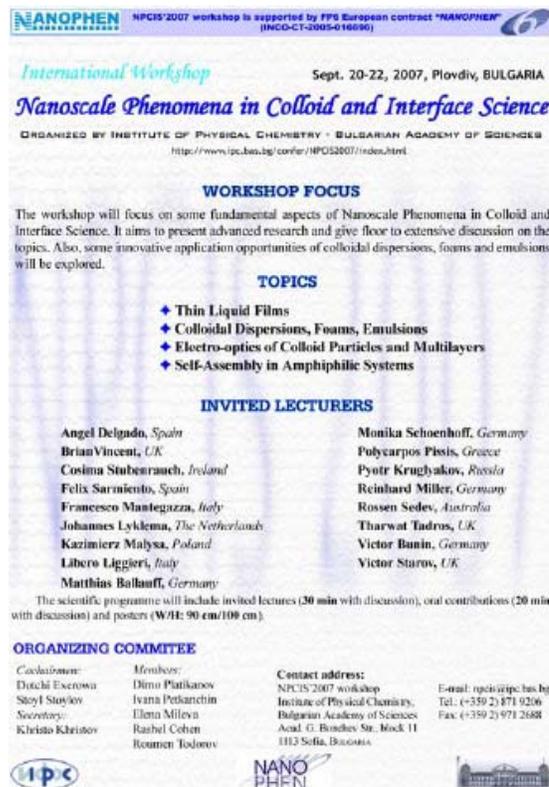
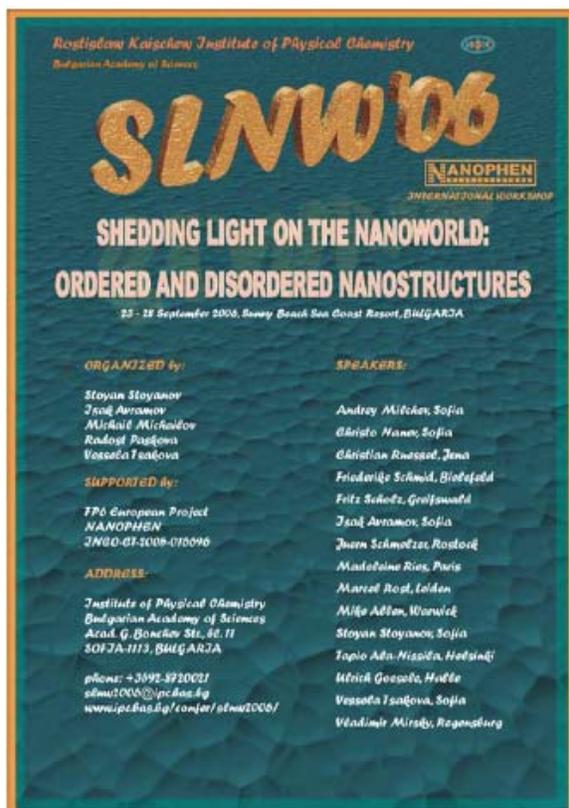
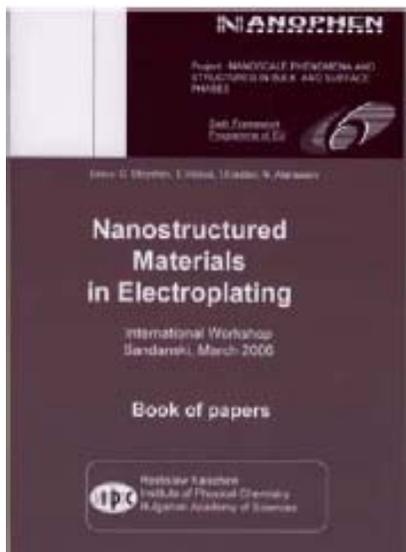
- NUCLEATION AND GROWTH PHENOMENA IN CRYSTAL AND AMORPHOUS MATERIALS
- INTERFACIAL PHENOMENA IN COLLOID SYSTEMS
- KNOWLEDGE-BASED MULTIFUNCTIONAL NANOMATERIALS WITH DIRECT INDUSTRIAL UTILIZATION

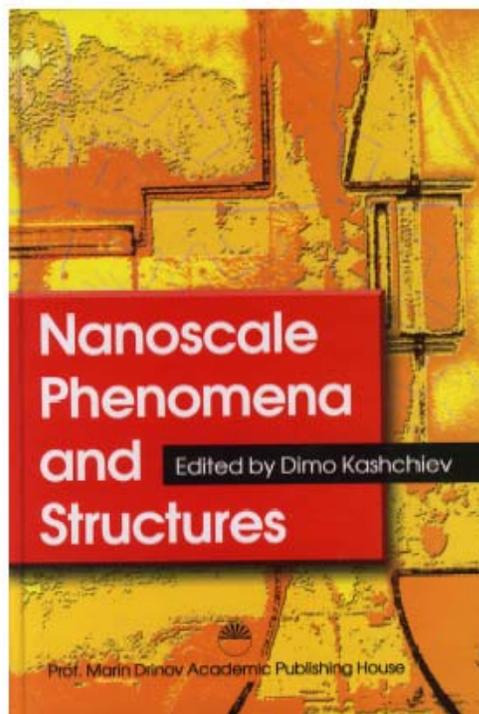

 FP6 EUROPEAN PROJECT
 INCO-CT-2005-016696



The implementation of this Program resulted in increased competence and expertise of the **core team of young researchers** build at IPC-BAS and contributed to the stabilization and development of the human resources, so as to ensure the long-term development of IPC-BAS as a research centre on a European level.

(ii) Organization of international scientific events: three **International Workshops**, two **International Experts Meetings** and one **International Conference**





These events play an important role in intensifying the contacts of IPC-BAS researchers with similar European research institutions, in identification of important new trends in the specific scientific field of research, particularly in (i) nucleation and growth phenomena in crystal and amorphous materials; (ii) interfacial phenomena in colloid systems; (iii) knowledge-based multifunctional nanomaterials with direct industrial utilization

(iii) Improvement and upgrade the material resources of IPC-BAS

The unique instrumentation for measuring surface forces between liquid interfaces has been upgraded. Two new equipments have been purchased: Differential Scanning Calorimetry with thermogravimetry and Scanning Electron Microscope with EDX-analysis. Besides, IPC-BAS LAN has been totally renovated, putting it on a new construction principle.



SECTION 1 – NANOPHEN OBJECTIVES AND MAJOR ACHIEVEMENTS DURING THE IMPLEMENTATION OF THE PROJECT

Overview of general objectives of NANOPHEN

In **2005** Institute of Physical Chemistry at the Bulgarian Academy of Sciences (IPC-BAS) was selected as **European Center of Excellence “Nanoscale Phenomena and Structures in Bulk and Surface Phases” (NANOPHEN)** and got a considerable financial support by FP6 project **INCO-CT-2005-016696**.

The NANOPHEN project was advanced in response to a specific FP6 call of EC: “Promotion of co-operation with Associated Candidate Countries: Reinforcement of the Associated Candidate Countries’ Research Capacities” (FP6-2004-ACC-SSA-2) targeted especially at Rumania, Bulgaria and Turkey. The call was related to the EC program of “Integrating and Strengthening the European Research Area”. The aim was to identify poles of scientific excellence in these countries, whose research activity is related to one of the basic priorities of FP6. The basic characteristics of these poles had to be (i) respectable history of scientific achievements; (ii) present state-of-the-art related to high level of research activities and availability of excellent researchers. The basic idea was that the presence of these features guarantees the most efficient stabilization of such institutions and EC funding will give an huge impulse to their progressive development in the next 5 – 10 years ensuring the effective integration in structure of the European Research Area.

The analysis of the **state-of the-art of Institute of Physical Chemistry** before the project implementation has shown the following:

- IPC-BAS has had very good achievements in the field of nanosciences, nanotechnologies and new materials and processes (NMP), and in particular in the fields of: (i) nucleation and growth of crystalline and amorphous materials; (ii) interfacial phenomena in colloidal systems; (iii) knowledge-based multifunctional nanomaterials with direct industrial application;
- IPC-BAS has had unique and original experimental instrumentation (for the investigation of surface forces at liquid interfaces, for the studying the initial stages of electrocrystallisation and crystallisation of proteins, etc.)
- IPC-BAS has had a group of eminent senior research scientists.

Three major problems have been identified:

- a constant lack of adequate funding of research activities (consumables, exchange of personnel and results, participation in scientific events, etc.);
- although IPC-BAS has had diverse scientific instrumentation, most of the setups had not been renovated in the past 18-20 years and have been totally morally and physically outdated;
- a strong tendency of “brain-drain” and age-misbalance has persistently developed, exhausting the human potential of the Institute.

Starting off this state-of-the-art, the **strategic goal of the project NANOPHEN** was to improve and reinforce the research capacity of the Institute of Physical Chemistry at the Bulgarian Academy of Sciences in the field of nanoscale phenomena in bulk and surface phases so as to foster the impact of nanotechnologies on the national scientific and economic development.

This goal transformed into the **specific objectives of NANOPHEN**, namely:

- to enhance the collaboration with similar institutions in Member States, to form stable networks, and to intensify exchange of scientific personnel and results;
- to upgrade key scientific equipment in IPC-BAS;
- to create a critical mass of highly qualified young researchers;
- to disseminate knowledge and results, to organize scientific meetings.

To achieve the objectives of the project the overall implementation plan has been broken down into four different work packages that cover the fields of the planned support activities and one package for the overall management of NANOPHEN:

- **WP 1: Enhancing collaboration with similar institutions in Member States**
- **WP 2: Upgrading key IPC-BAS equipment and electronic communication tools**
- **WP 3: Creating new career prospects for young researchers**
- **WP 4: Dissemination of knowledge**
- **WP 5: Management of NANOPHEN**

A set of measures was proposed aiming at **intensification of the collaborative research activities** in the field of NMP, based on shared and jointly exploited knowledge, instrumentation and information, and on exchange of personnel. Considerable funds were also allocated for **upgrading** the unique **equipment** for measuring surface forces between liquid interfaces, and for the purchase of a new Scanning Electron Microscope with EDX-analysis used in the studies of knowledge based materials, nucleation and growth of nanocrystals. Upgrade of the original setup for differential scanning calorimetry was performed, too. A reinforcement of human resources of IPC-BAS by the **formation of a core team** of young researchers, able to ensure the long-term development of IPC-BAS as a leading Nanoscience and Knowledge-based-materials Center on a European level was one of the key actions carried out by the project. The aim was to open new positions for young chemists and physicists, to create better career opportunities for prospective young scientists. A Pilot Program for improving experimental skills and fundamental knowledge of young researchers was elaborated. A special emphasis was set also on the organization of **three International Workshops and one International Scientific Conference** focused on transfer of knowledge, accumulated via the research activities in IPC-BAS and on intensifying of all collaborations of our scientific staff with MS research teams in the NMP area. These events aimed at presenting and promoting the scientific achievements of IPC-BAS in the field of nanoscience and nanomaterials before the scientific community and the potential industrial users, as well as on significant intensification of the collaborative links and cooperation activities with EU partner laboratories.

All these objectives were situated within the context of the **initial state-of-the-art in IPC-BAS**. The Institute has always striven at maintaining constant collaborative links with leading MS research institutions of similar profile. Due to constant lack of adequate funds however, these links have rarely been put into the context of the strategy for the future development of the Institute. The **funding from EC** has given us new perspectives to mobilize the material and human resources so as to focus the activities on research topics that are most suited to our expertise. The **EC support** has allowed us to upgrade key equipment units that are crucial for the infrastructure stabilization of the Institute. The support activities of NANOPHEN set the foundations of new career

prospects for talented young researchers assuring them advanced training through research, exchange of knowledge and personnel with MS partner laboratories and regular participation and access to scientific information and events.

Summary of the work performed, main achievements

In general NANOPHEN implementation has been focused on the following major types of activities:

- to ensure mobility of the research staff of IPC-BAS for gaining access to unique equipment units and for performing of joint complementary and interdisciplinary research
- to create new links with partner institution, to initiate new networking connections with other research centers of similar profile in Member States
- to create on-line virtual medium for discussion, problem formulation and brainstorming
- to organize the purchase of the key upgrade equipment units
- to improve the internal (Intranet) and external (Internet) electronic communication systems
- to outline measures for and to start creating a critical mass of highly-qualified young researchers
- to elaborate a coherent program for advanced training of young researchers and engineers in the scope of the thematic priority NMP
- to organize three International workshops and one International Conference focused on the thematic priorities of IPC-BAS in NMP, namely (i) nucleation and growth of crystalline and amorphous materials; (ii) interfacial phenomena in colloidal systems; (iii) knowledge-based multifunctional nanomaterials with direct industrial application.

The **key achievements in the three years of NANOPHEN** implementation might be summarized as follows:

- The enhancement of the **networking** activities of IPC-BAS researchers have resulted in a number of responses to FP6 calls (7), in two successful FP6 STREP projects, participation in one FP7 COST project and several applications for the new FP7 calls.
- The purchase and the setting into full operation of the **new equipment units** has improved significantly the technical level of the material resources of IPC-BAS.
- The **NANOPHEN exploratory workshops** were exclusive in renewal and intensification the contacts of IPC-BAS researchers with similar European research institutions, in identification important new trends in these specific scientific field of research namely nucleation and growth in crystalline and amorphous materials, interfacial phenomena in colloidal systems and, in revealing the possible industrial applications of the knowledge-based materials studied by IPC-BAS scientists.
- The final **International Conference “Nanoscale Phenomena and Structures in Bulk and Surface Phases”** has achieved its basic goal to enhance the collaboration with similar research institutions in the European Union and to initiate European scientific networks in the thematic priorities of the NANOPHEN Project

- A new level of dissemination of knowledge and results acquired in IPC-BAS was achieved due to **increased mobility** (22 short term research visits) and active **participation in international scientific events** (45 participations with 52 presentations).
- The various activities within the **Pilot Program** for multidisciplinary practical training on nanoscale phenomena and structures in bulk and surface phases created a new atmosphere of interaction and communication of both the targeted **core group of young researchers** and the senior Bulgarian and foreign lecturers thus stabilizing the human potential in IPC-BAS.
- New job openings (7) and additional support for young researchers (17) has resulted in a departure from the negative tendency of “brain-drain” of young researchers and the formation of a core team of talented young researchers in IPC-BAS.

So, the basic result of the implemented actions is that IPC-BAS has been converted into a **high-level European research and advanced-training Center in the field of NMP**.

Most important problems during the project implementation

Throughout the three years of NANOPHEN a number of difficulties were encountered. Part of the problems were related to the fact that the main expenditures concerning the **purchase of equipment units** have been entirely allocated in the first year of the project. According to the Bulgarian accounting and legal regulations however, the tender procedures demand certain fixed time limits and need some legal actions that were also time consuming. So, substantial efforts were required and put in these activities by both the project management team (Executive Committee and the respective task managers), and by the administrative and financial authorities of IPC-BAS. Considerable experience in this matter was acquired and all the foreseen actions were completed within the planned time schedule.

Another serious problem that we have encountered is the constant “drain” of talented young researchers, both from the country and from natural sciences, in general. This tendency has been sustained throughout more than a decade in Bulgaria. It was not possible to turn it off so quickly, even though we have initially allocated higher wages for the new job openings funded by NANOPHEN. This tendency has persisted for some time due to inertia. However, the substantial raise of the quality of the material resources, the better working conditions and advanced-training opportunities, as well as the new career prospects offered via the NANOPHEN funds has finally overturned this tendency. Particularly in the second year due to the full implementation of the Pilot Program for multidisciplinary practical training on nanoscale phenomena and structures in bulk and surface phases created a new atmosphere of interaction and communication of both the targeted **core group of young researchers** and the senior Bulgarian and foreign lecturers. The second and the third year of the project implementation were marked by considerable rise-up of participation of the young researchers in the various schemes of short-term scientific exchange with leading EU research groups and institutions, in the focused International Workshops and Conference organized by NANOPHEN team and the freedom of choosing the appropriate International scientific events and schools to participate has resulted in a considerable stabilizing the human potential in IPC-BAS. Although during the lifetime of the project the mid-term prospects for the financial status of young researchers (without external support)

remained still unclear, an important additional impulse to this tendency of stabilizing the human potential gave the recent new funding schemes for science issued by the Bulgarian Ministry of Education and Science, as well as the overall intensification of the scientific research and dissemination of knowledge in IPC-BAS triggered by the substantial EC funding by the project NANOPHEN.

Conclusions and future prospects for IPC-BAS

The actions funded by FP6 through the project NANOPHEN have created a completely new scientific background in IPC-BAS and have started out and stirred a whole series of other initiatives that have created an entirely new and inspiring scientific environment in the Institute. Never before have been the scientific staff so active in searching and establishing new contacts and collaborations with EU research groups, in submitting project proposals within the EC FP6 and FP7, in participating in various scientific forums. The efforts for networking with Member States scientific institutions and the further integration of IPC-BAS in European Research Area will continue and intensify with the progression of FP7 calls.

Setting into operation of the newly bought equipment units is one of the most important outcomes of the project NANOPHEN. It resulted in a new quality of the material resources of IPC-BAS. The elaboration and implementation of all the elements of the Pilot Program for coupled multidisciplinary training and fundamental knowledge on nanoscale phenomena has strengthened the human resources in IPC-BAS. The efforts in this direction will be continued by diversification of the approaches for attracting and keeping back talented young researchers. One immediate aftermath is the already gained significant funding from the Bulgarian Ministry of Education and Science aimed at sustainable development of the career prospects of young researchers and PhD students in IPC-BAS. This three year project is targeted at keeping the standards of education through research and active participation in EU scientific forums and schools already established by the project NANOPHEN.

The line of intensive dissemination of knowledge and organization of scientific events will be also kept. In this year alone two more events are already scheduled:

1. VIth "Stranski-Kaischew" Surface Science Workshop SK-SSW 2008 "Nanophenomena at surfaces: Fundamentals of exotic condensed matter properties", 20 - 26 September, 2008, Sunny Beach, Black Sea Coast, Bulgaria

2. International Workshop CISPS'08 Crystallization Induced Stresses and Porosity in Solids, 26 - 27 September 2008, Sts. Constantine and Elena, Black Sea Coast, Bulgaria, in the framework of Project TK-X1713/07

Last but not least, the already well-established activities aimed at wider relations to public, advertising and publicizing the various IPC-BAS initiatives will be intensified (further activities within the frameworks of the National Center for Nanotechnologies, the Days of Open Doors in IPC-BAS, popular lectures and participation in various initiatives targeting the undergraduates in the Universities, etc.).

To summarize, all the implemented actions have been related to the **general perspectives and impact of NANOPHEN** on the future development of IPC-BAS, namely

- **intensifying IPC-BAS research** activities in the field of **NMP** and enhancing its participation in **ERA**

- adding **new value to the national scientific potential** in the thematic priorities of NANOPHEN
- opposing the negative trend of age-misbalance in science and the “brain-drain” of Bulgarian young researchers
- **increased visibility of IPC-BAS** scientific activities at the European level, intensified networking and increased participation in the national and European competitive funding programs
- **converting IPC-BAS into a high-level European research and advanced-training Center**

SECTION 2 – WORKPACKAGE ACTIVITIES

WP 1: Enhancing collaboration with similar institutions in Member States

T 1-1: Organizing exchange of personnel and of joint experiments

The basic objectives of the WP 1 of NANOPHEN were to ensure **mobility of the research staff of IPC-BAS** for gaining **access to unique equipment** and for performing of **joint complementary and interdisciplinary research**. As the starting point, the task managers performed an identification of the prospective needs for access to unique equipment in MS partner institutions and joint experiments of IPC-BAS researchers (M 1, Table 2, Section 3). A detailed **Report on the prospective needs for access to unique equipment and joint experiments of IPC-BAS researchers and schedule for provisional exchange of scientists** was created (D 2, Table1, Section 3). It was based on an extensive analysis of the specific scientific topics related to the main priorities of the NANOPHEN project. The analysis allowed the identification of scientific problems, of complementary or unique equipments, necessary to be accessed, and of their availability in MS partner institutions. The collected data were specified according to the three main thematic priorities of NANOPHEN:

- *Nucleation and growth phenomena in crystal and amorphous materials*
- *Interfacial phenomena in colloid systems*
- *Knowledge-based multifunctional nanomaterials with direct industrial utilization*

Twenty two researcher visits were performed by scientific employees of IPC-BAS in EU countries research centers with the financial support of NANOPHEN. They have resulted in 8 scientific publications and more than 50 presentations on various scientific forums:

1. Maria Ilieva worked for 20 days (8-28 October, 2005) in the Max-Planck Institute of Microstructure Physics in Halle, Germany. The investigated metal-polymer composite samples have been synthesized in the Laboratory of electroconductive polymers and metal-polymers composites at the Institute of Physical Chemistry (IPC-BAS). The aim of the joints experiments was to investigate the surface morphology, elemental composition, and size of deposited micro- and nanoparticles and the nature of chemical bonds of two types of metal-polymer composite materials. The following techniques for characterization of the samples that are not available in IPC-BAS have been used: High Resolution Transmission Electron Microscopy (HRTEM), Electron Energy Loss Spectroscopy (EELS), High Resolution Electron Microscopy (HREM) and Energy Dispersive X-ray Spectroscopy (EDXS) including analysis of light chemical elements. A joint manuscript was published ("Electrochemical formation of bi-metal (copper-palladium) electrocatalyst supported on poly-3,4-ethylene-dioxythiophene" by M. Ilieva, V.Tsakova, W. Erfurth, *Electrochimica Acta*, Vol. 52, 816 (2006), see Appendix 1).

2. Bogdan Ranguelov spent two months (March-April, 2006) in the group "Morphology of Surfaces" at CRMC-N/CNRS, Luminy, Marseille, France, where he was involved in joint research experiments on the dynamics of steps on vicinal Si(111) surface with miscut angle 0.5°. These experiments were done on a unique UHV electron microscope, providing a Reflection-Electron-Microscopy (REM) mode of observation

and ability for resolving in situ dynamics on surfaces at growth, equilibrium or sublimation. In addition to the REM technique, a new one, namely Low Distortion Reflection Electron Microscopy (LODREM) was also applied, thus revealing in much more details the dynamics of three dimensional structures on the crystal surface, such as spirals of growth or sublimation. The results were presented on the second NANOPHEN International Workshop “Shedding Light on the Nanoworld – ordered and disordered nanostructures” and on the First non-VIRtUal Meeting: “Instabilities at Surfaces” in 2006. A joint article was published (“Spirals on Si(111) at Sublimation and Growth – REM and LODREM Observation” with authors B. Ranguelov, J.J. Metois and P. Muller, Surface Science Vol. 600, 4848 (2006), see Appendix 1).

3. Kamelia Kamburova spent one month (27 March, 2006 – 25 April, 2006) in the University of Bayreuth, Germany. The aim was to perform investigations of nanoparicles and polyelectrolyte-colloid complexes with electric birefringence instrumentation. The latter is complementary to the method of electric light scattering available in our Laboratory of Electro-optics. The obtained results have been included in a paper (“Electro-optics of colloid-polyelectrolyte complexes: Counterion condensation on free and adsorbed sodium carboxymethyl cellulose”, K. Kamburova, Ts. Radeva, J.Coll.Interface Sci., Vol. 313, 398 (2007), see Appendix 1).

4. Teodora Zaprianova visited for a month (April, 2006) the Institute of Thin Films and Interfaces, Research Center, Juelich, Germany for a cooperative research on “Electrochemical deposition of metal nano-clusters and decoration of crystalline and amorphous surfaces”. The aim of the experiments was to study the electrochemical nucleation and growth of metal (Cu) nano-clusters and to obtain information on the spatial distribution of active sites for nucleus formation on crystalline and amorphous substrates. The visit was a good start for a future collaboration with the colleagues from the Research Center, Juelich.

5. Rashko Rashkov visited from 11-th to 20-th May 2006 the Erich Schmid Institute of Material Science, Austrian Academy of Sciences. The aim of this joint research was to study the microstructure and phase composition of NiW coatings deposited on carbon fibers supports and CoMnB powder systems using Transmission Electron Microscope (TEM). After additional measurements and analysis of the diffraction patterns a joint article is prepared (“Microstructural characterization of Ni/WO_x/TiO_x thin films on carbon fiber supports”, R.Rashkov, G. Dehm, submitted). Dr. Rashkov gave also a talk on: “Structure and behavior of Ni- and Co-based systems”.

6. Tsvetina Dobrovolska spent 3 weeks (May 15 to June 3, 2006) in the Institute of Precious Metals and Metal Chemistry, Schwaebisch Gmund, Germany. She applied an advanced X-ray diffractometer for a precise determination of the phase composition of the silver-indium coatings, containing periodical spatial-temporal structures. Using a non-destructive laser profilometer method, precise measurements of the micro-roughness of alloys, containing spatial-temporal structures were done. During her visit, Dr. Dobrovolska also participated in a qualification course MINDE (Micro and Nanodeposition), organized by the European Academy of Surface Technology /EAST/ within the framework of the European Community educational program “Marie Curie”. (28.05-02.06.2006)

7. Nikolai Boshkov spent a week in the Department of Materials Science and Engineering, Section “Surfaces and Interfaces, Corrosion Technology and Electrochemistry”, TU Delft, The Netherlands. His visit was realized in the period of 19 – 25 June, 2006. The aim was to evaluate the possibility to use some research methods,

available in this Department, for corrosion and surface characterization of zinc and zinc-based nanocomposite coatings, as well as to discuss the future collaboration, provisional joint projects, etc. The possibility to use the method of Scanning Vibrating Electrode Technique (SVET) for the estimation of the corrosion properties of composite layers with incorporated nanosized polymeric particles was discussed. Some investigations on the surface morphology, using Environmental Scanning Electron Microscopy (ESEM) were performed on corrosion atmosphere treated and non-treated specimens.

8. Plamen Tchoukov has spent one month (10th of July to 10th of August, 2006) in the Institute of Catalysis and Surface Chemistry, Polish Academy of Sciences, Cracow, Poland. During his stay there he has conducted Dynamic Light Scattering measurements using two apparatus: modern Malvern Nano ZS with resolution from 0.6 nm and multi-angle Submicron particle sizer – N4 Plus Coulter. The aqueous solutions of cetyltrimethylammonium chloride were studied at different salt content (0.0M, 0.1M and 0.5M NaCl) in broad interval of surfactant concentrations. The dependence of the intensity of scattered light and the size of aggregates on the surfactant concentration was obtained for these different salt concentrations. The effect of temperature on the self-assembly of surfactant molecules was also studied.

9. Kamelia Kamburova spent one month (19.03.2007 – 17.04.2007) in the University of Bayreuth, Germany thanks of the financial support by NANOPHEN. The topic of her research was “Complexation of polyelectrolytes in solutions”. She carried out investigations by means of transient electric birefringence and potentiometric titration in the laboratory of Prof. H. Hoffmann. The aim of the investigations was to obtain information about the changes in the charge density and conformation of the chains of polyelectrolytes in solution upon ionization. The conformational chain transition of polyelectrolytes (polyacrylic acid (PAA) and polyethyleneimine (PEI)), depending on the degree of neutralization of the charge, was investigated by transient electric birefringence (TEB). The obtained results are included in the Mrs Kamburova’s PhD thesis.

10. Desislava Guergova spent 24 days in Justus-Liebig University, Giessen, Germany. The topic of her research work was “Corrosion resistance of nano-composite ceria and alumina thin oxide films”. She participated in the following activities: AFM studies of the surface structure and morphological peculiarities of thin $Ce_2O_3 - CeO_2$ and Al_2O_3 layers and their combinations electrodeposited from non-aqueous electrolytes on OC 4004 stainless steel (SS); X-ray low-angle diffraction study of the possible changes in structure and lattice parameter during electrodeposition of $Ce_2O_3 - CeO_2 / SS$ and $Ce_2O_3 - CeO_2 / Al_2O_3 / SS$; study of the conductivity of electrochemically deposited $Ce_2O_3 - CeO_2$ and Al_2O_3 films by impedance spectroscopy.

11. Tsvetina Dobrovolska was supported financially by NANOPHEN for 10 days visit to the University of Science and Technology in Cracow, Poland (March 02, 2007 - March 11, 2007). She had an opportunity to work with Atomic Force Microscope on the NTEGRA-research system of the NT-MDT Co., Russia. Her activities included the following: topography studies of the series of Ag-In alloy coatings preliminary electrodeposited under various electrochemical conditions. The results about the investigated areas were complemented by optical images on the same place obtained by the incorporated CCD-camera in the NTEGRA-research system; precise measurements were taken of the topography of the surface, containing spatial-temporal structures that

allowed the micro-roughness of the coatings in different zones to be successfully compared.

12. Alexander Zhivkov spent one month in the laboratory of Surface Structure and Materials, Department of Science and Techniques, the University of Franche-Comte, France, March 19 – April 19, 2007. He carried out experiments on adsorption of polymer-coated nanoparticles on the surface of silica and metal electrode using two unique optical instruments, constructed in this laboratory. Both devices are working on the principle of laser reflective refractometry and allow in-situ registration of the optical properties and the quantity of the particles in adsorbed layer at controlled flow rate. The obtained results are useful for the interpretation of the electro-optical data for optical properties of colloid particles coated by layer adsorbed nanoparticles.

13. Svetlozar Ivanov spent 2 months (01.05 – 29.06.2007) in the University of Regensburg, Germany. The topic of his work was: Investigation of electrochemical and conductometric properties of polyaniline in presence of different additives. Layer by layer self assembly of polyaniline (PANI) – polystyrene sulfonate (PSS): characterization and analytical application. A new simple approach for automated LbL deposition using dynamic adsorption of alternating PANI – PSS layers in flow cell compartment was also suggested. The automated method was realized using electromagnetic valve which provides repeated change between two polymer solutions. The constant flow rate was supplied by peristaltic pump. Using this technique PANI and PSS solutions subsequently pass through the flow cell with a period 4 min and form the alternating LbL structure on the surface of gold electrode set inside the flow cell. A joint paper is published (S. Ivanov, V. M. Mirsky, V. Tsakova “Multilayer adsorption of PANI-PSS coatings. Electrochemical properties and analytical application”, in “Nanoscale Phenomena and Structures”, edited by D. Kashchiev, Prof. M. Drinov Publishing House, Sofia, 2008, p.289-292, see Appendix 1).

14. Anna Gurova carried out studies on nanoparticles and different bacteria strains with turbidity in electric field. The research was performed in the Laboratory of Biotronix GmbH, Berlin, Germany within the period of 02.05.2007 – 02.06.2007. Her work was related to the Maxwell-Wagner polarizability of bacteria *Lactobacillus plantarum*, *Escherichia coli HB101* and *K12*, and nano-particles β -FeOOH. For this purpose it was needed to make electro-optical measurements in the high frequency region. Such investigations are impossible in IPC-BAS, because the electric light scattering device, available in Institute, is limited to 500 kHz. The electro-optical behavior of the objects mentioned above was studied in a wide range of frequencies to clear up the essence of the polarizability observed and compare it to the theoretical expectations. A joint paper is published (A. Gyurova, R. Georgieva, S. Danova, V. Bunin, A. Angersbach, S. Stoylov “Influence of polyelectrolyte charge density on multilayer films growth”, in “Nanoscale Phenomena and Structures”, edited by D. Kashchiev, Prof. M. Drinov Publishing House, Sofia, 2008, p.211-214 see Appendix 1).

15. Eugenia Valova worked in Université Libre de Bruxelles (ULB, Wallon) and Vrije Universiteit Brussels (VUB, Flemish) during 22 days stay in Brussels (June 13 – July 4, 2007). The main theme of the joint experiments was preparation and tribological characterization of the following nano-structured multilayered materials: (i) electroless deposited bi-layered Ni-W-P/Ni-Cu-P/steel; (ii) sputtered TiN/Ti/ Ni-Cu-P/steel. The electroless deposited Ni-W-P (nano-crystalline) and Ni-Cu-P (amorphous) films were prepared and their composition was determined by EDX in IPC. The hybrid materials TiN/Ti/Ni-Cu-P/steel were made in Brussels, at ULB, by cathodic reactive magnetron

sputtering on top of NiCuP/steel specimens, prepared at IPC. Friction curves and friction coefficient were obtained by the *pin-on-disk* method with a CSEM Tribometer, (Newchatel, Switzerland). For evaluation of the worn coating's volume the Dektak 3030 Microprofilometer was used, combined with optical microphotographs and scanning electron microscopy with EDX. Nanotribological studies of the multilayered specimens were performed on Triboscope Hysitron, combined with AFM. The columnar structure of sputtered coatings was studied on FIB sections of TiN/Ti/ Ni-Cu-P/steel films made with Dual Beam FIB-SEM Quanta200 3D at ULB. For high resolution with high magnification imaging the JEM 7000F (with LaB₆ field emission gun) at VUB was used. In addition, FIB sections of electroless Co-Re-Ni-P nanocrystalline films on amorphous NiP layers were prepared and investigated with Scanning Auger electron probe with resolution of several nanometers using JAMP 9500F field emission EM at VUB. The partial segregation of Re at grain boundaries was observed by Auger line scan analysis.

16-17. Vesselin Tonchev and Bogdan Rangelov spent one month (October, 2007) in the computational physics group of Professor Panos Argyrakis at the Department of Physics, University of Thessaloniki. The stay was related to two tasks: acquaintance with the already build computer cluster architecture and performing some calculations on this cluster, concerning our current work in the Institute of Physical Chemistry. The first stage of the visit was related to training on performing and submitting some basic tasks on the computer cluster working under Scientific Linux operating system, namely submitting and queuing elementary batch processes to be executed using specific tools such as MPI (message passing interface) and Torque (the main utility for maintaining and managing parallel jobs on a computer cluster).

The second stage of the visit was related to submitting real computational jobs to the cluster. Two scientific problems were considered. The first one (for which a special executable code was developed during the stay in Aristotle University) is about simulating the process of diffusion limited aggregation growth when two types of particles are simultaneously deposited on the surface. A very large amount of calculations was done studying the different morphologies (and the corresponding fractal dimension) and their dependence on the birth radius (release radius) of the particles and on the four possible sticking coefficients. An article with the obtained results is prepared and sent for publication ("Morphologies and morphology transitions in modified DLA models" B. Rangelov, V. Tonchev, H. Popova, M. Velinova, R. Yakimova, submitted, see Appendix 1). The second scientific problem that requires a huge computational power is related to the so-called Popkov-Krug model of step bunching instability on vicinal surfaces (Phys. Rev. B **73**, 235430 (2006)). A very large data (4 GB) from the calculations on the computer cluster is collected which is still subject of processing. The main purpose of this calculations was to obtain the size and time scaling in the Popkov-Krug model, thus to be able to define the exact class of universality of this model.

Two lectures were presented: from Vesselin Tonchev – "Step bunching on vicinal surfaces: basic models and results", and from Bogdan Rangelov – "Spirals on Si(111) at sublimation and growth". During the stay there have also been performed informal meetings with potential partners from Aristotle University for collaboration and participation in FP7 calls during 2008.

18. Maria Ilieva worked in Max-Planck Institute of Microstructure Physics (MPI) in Halle, Germany from October, 6 to November, 19, 2007. The topic of her research

was polymer and metal-polymer composite samples, synthesized in the Laboratory of electroconductive polymers and metal-polymers composites at the Institute of Physical Chemistry. The aim was to provide information for creating new or improved functional or structural materials in application areas such as sensorics, opto- and microelectronics. The samples were characterized on both irradiated and non-irradiated parts by SEM and EDXS. SEM imaging and elemental analyses were accomplished at a computer driven Field Emission Scanning Microscope JSM - 7500F with resolution 1.2 nm and acceleration voltage 0.5 kV - 30 kV equipped with conventional secondary electron detector, semi in-lens detector, semiconductor backscattered electron detector and EDXS system Quantax 200.

19. Tsvetina Dobrovolska visited the Institute of Precious Metals and Metal Chemistry in Schwäbisch Gmünd, Germany from June 23, 2007 to July 8, 2007. She performed the following investigations: a/ The silver-indium alloy phase composition depending on the electrolysis conditions was determined making use of step-by-step increase of the temperature. The appearance of a new phase Ag_4In is a result of increasing the solubility limit of indium in the silver phase in the high temperature range; b/ The structure of newly developed electrodeposited silver-cobalt alloy was characterized; c/ Measurements of the internal stress of silver-cobalt coatings were carried out. The results were monitored with the apparatus constructed by Stalzer, operating on the principle of the one-sided galvanized bendable cathode. The method permits in situ monitoring of the internal stress during electrodeposition.

20. Feizim Hodzhaoglu worked in the University of Regensburg, Institute of Analytical Chemistry, Chemo- and Biosensors, Germany, 13-21 July 2007. He performed experiments on crystallization of lysozyme and albumin molecules in the presence of native gold nanoparticles and with hydrophilic or hydrophobic organic covers. Mr. Hodzhaoglu was introduced in the ways for chemical obtaining and purification of aqueous solution containing gold nanoparticles. More complicated for him was the case of gold nanoparticles covered with hydrophobic organic substance containing alcohol for stabilizing the nanoparticles in aqueous solution but denaturizing or precipitating the proteins in the crystallization samples. Besides the experimental work Mr. Hodzhaoglu participated in the preparation of an initial draft of a science article based on the experimental results obtained in Sofia and Regensburg ("Gold nanoparticles induce protein crystallization", F. Hodzhaoglu, F. Kurniawan, V. Mirsky, C. Nanev, Crystal Res. Technol. DOI 10.1002/crat.200811125, in press, see Appendix 1).

21. Ivaylo Dimitrov visited the Biomedical Center (BMC), Uppsala, Sweden, 18 November 2007 – 22 January 2008. He worked under the supervision of Dr. Maria Selmer, a group leader in the Structural Biology Labs at BMC. He was involved in the project "The molecular details of HPV proteins and their interactions with other proteins". The overall goal of the project is a development of new drug candidate against HPV-induced cancer. Ivaylo Dimitrov took part in the work on crystallization of a protein complex constituted of the PDZ2 domain of the protein SAP97 (a tumor suppressor protein) and the C-terminal domain of E6 from HPV-16 (viral protein from Human Papilloma Viruses family). All of the experiments were conducted according to the vapor diffusion method in the sitting drop modification using either automatic protein crystallization robot (Oryx 6 from Douglas Instruments, Ltd. (96x2-well plates were used)) or set manually in 24-well plates. The samples were varied in precipitant type (mentioned above) and concentration, buffer type (sodium cacodylate, MOPS, sodium acetate) and concentration as well as pH (covering all ranges commonly used in

crystallization of proteins for a particular buffer type according to the book of Terese Bergfors “Protein crystallization”). Crystalline precipitates were finally obtained after a week at unusually low PEG 8000 concentrations (around 4% (w/v)). Fine crystallization screening was then performed around the most promising conditions in this low PEG crystallization set. The protein complex system behavior was also tested at very high PEG 3350 and PEG 8000 concentrations (20%-36% (w/v)) which should lie beyond the liquid-liquid phase separation region of the pseudo phase diagram at the particular crystallization set.

During his stay at BMC, Uppsala Dr. Dimitrov attended the X-ray crystallography course (23.11.2007 – 19.12.2007), organized by the Department of Molecular Biology at BMC (Institute of Cell and Molecular Biology), <http://xray.bmc.uu.se/xtal/>. The course covered all topics of structure determination of biological macromolecules, program schedule and teachers listed on the web site. He passed the exam on 18.01.2008. Dr. Dimitrov was invited by Dr. Maria Selmer to present a short talk about his work in IPC, BAS. The presentation with title “Protein crystallization under high gravity: experimental approach in a tube centrifuge” is registered in the section “Friday seminars” at <http://xray.bmc.uu.se>.

22. Rumén Todorov is paying a visit to the Institute of Catalysis and Surface Chemistry, Krakow in June 23-19, 2008. The stay is in connection with Joint Research Project: Stability and Nanostructures of Foam and Wetting Films under Equilibrium and Dynamic Conditions. The study aims at determining influence of adsorption layer formed by bovine serum albumine (BSA) on stability of single foam films, single bubbles, foam layer, and rising velocity of the bubble. It is found that the stability of the microscopic foam films and lifetime of single bubbles were significantly affected by the pH of BSA solution, due to the modification of the electrostatic state of the adsorption layer. The variation of the solution pH can lead to a decrease in the potential of the diffuse electric layer ϕ_0 in foam films. At the isoelectric pH (pH=4.8) for 1.5×10^{-7} M and 1.5×10^{-5} M BSA the ruptured films with black spot formation are observed. Increasing the BSA concentration leads to rheological drainage and decreasing in film thickness. At pH 5.9 the obtained foam films are common thick. With the decreasing of pH (from 5.9 to isoelectric point) the potential of the diffuse electric layer decreases and at pH 4.8 is close to zero. It means that in these points the electrostatic component of the disjoining pressure does not ensure the film stability. To elucidate the effect of pH on the properties of BSA adsorption layer the experiments were extended to pH values below the isoelectric point. The purpose of the visit is to perform some additional experiments with single bubbles and foam column decay, as well as to discuss the obtained results and prepare a joint paper.

T 1-2: Stimulating the scientific staff to participate in other collaboration programs and instruments of FPs

Another important trend of project activity within WP 1 was the stimulation of the scientific staff to **participate in other collaboration programs and instruments of FP6 and FP7**. Never before has the scientific staff of IPC–BAS been so active in the preparation and submission of new projects to FPs of EC. One of the reasons is that the researchers were encouraged by the success of the NANOPHEN project. And particularly valuable was the possibility to provide financial assistance of the trips for preliminary (on a preparation stage) meetings of the participants in collaborative EU projects. During the time of NANOPHEN implementation there have been 23 responses

to various calls closely related to the thematic priorities of NANOPHEN, with 13 successful outcomes and 1 on the stage of evaluation.

A. Responses to FP6 calls:

Two projects with the participation of members of the Institute of Physical Chemistry have been **approved for financial support by EC**. Here are some details about the successful projects.

1. Project title: “**Integrated Microfluidic Bench Technologies for Active Control of Unconventional Fluid by Functionalised Material Interface of Complex Geometry Microchannels**”, (INFLUS) STREP, Priority: NMP (Call title: Development of fundamental knowledge (FP6-2004-NMP-TI-4); Activity code: 3.4.2.1.1 Interfacial Phenomena in Materials); Duration: 36 months; Total sum: 2 200 200 Euro; Participants: *IPC-BAS, Sofia, Bulgaria*; University of Oxford, UK; University of Goettingen, Germany; Consiglio Nazionale delle Recerce, Italy; University of Mons-Hinault, Belgium; Delft University of Technology, The Netherlands; Fraunhofer Inst., Germany; Istituto Nazionale di Fisca della Materia, Italy; "Micronit", The Netherlands; "Microfluidic Chip Shop", Germany; Institute of Analytical Sciences, Germany.

Project Coordinator: David Palmieri, D'Appolonia S.p.A , Italy

Leading participant from IPC–BAS: Prof. Andrey Milchev

2. Project title: ”**Interface Controlled Nucleation and Crystallization**”, (INTERCONY), STREP, Priority: NMP; Duration: 36 months; Total sum: 1 400 000 Euro; Participants: Jena University, Otto-Schott-Institut, Germany; *IPC-BAS, Sofia, Bulgaria*; Institute of Physics, Aristotle University of Thessalonica, Thessalonica, Greece; Schott AG, Mainz, Germany; Leibniz-Institute for Surface Modification, Leipzig, Germany; Instituto de Cerámica y Vidrio, Madrid, Spain.

Project Coordinator: Prof. Dr. Christian Rüssel , Germany

Leading participant from IPC–BAS: Prof. Isak Avramov

Besides, other **seven projects** were **submitted**, highly evaluated, but were **not approved** for financial support from EC:

1. Project title: “Combinatorial electrochemical synthesis as a new technology for development of smart organic devices” (COMBITECH), Nr. 033253, STREP, Priority: NMP; Project Coordinator: Prof. Vladimir Mirsky, University of Regensburg, Germany; Leading participant from IPC–BAS: Prof. Vessela Tsakova

2. Project title: “Innovative technologies to produce multifunctional hybrid materials” (INTECH), Nr. 033284, STREP, Priority: NMP; Project Coordinator: Prof. Carmel Breslin, National University of Ireland, Maynooth, Ireland; Leading participant from IPC–BAS: Prof. Vessela Tsakova

3. Project title: “Combinatorial electropolymerization: new technology for development of smart organic devices” (COMPONET) , Nr. 035618-1, Marie Curie Actions, RTN; Project Coordinator: Prof. Vladimir Mirsky, University of Regensburg, Germany; Leading participant from IPC–BAS: Prof. Vessela Tsakova

4. Project title: “Nanoscale and Engineering Approach to Complex Electrochemical Phenomena in Civil Structures” (NEACEP), Priority: NMP; Project Coordinator: Prof. K. van Breugel, TU Delft, NL; Leading participant from IPC–BAS: Prof. Nikolay Bozkov

5. Project title: “Interfacial Phenomena in Polyolefin Nanocomposites” (INPON), Priority: NMP; Project Coordinator: Prof. F. Ferrarese, PLASTAL SPA, Italy; Leading participant from IPC–BAS: Prof. Ivan Krastev
6. Project title: “Surfactants and Interfaces in Dynamics and Equilibrium” (SIDE), Priority: NMP, Marie Curie Actions, TOK; Project Coordinator: Prof. Piotr Warszynski, Institute of Catalysis and Surface Chemistry, Cracow, Poland; Leading participant from IPC–BAS: Prof. Dotchi Exerowa
7. Project title: “Microfluidic Foam Separations” (MIFOAM), Priority: NMP, NEST Proposal; Project Coordinator: William Zimmerman, University of Sheffield, Sheffield, UK; Leading participant from IPC–BAS: Prof. Dotchi Exerowa

B. New successful FP7 project:

During the second year of the NANOPHEN project Prof. Elena Mileva was invited to participate in **COST-Action D43: “Colloid and Interface Chemistry for Nanotechnology”**, Workgroup No. 6 “**Soft nanoscale devices and machines**” (<http://www.cost.esf.org/index.php?id=1432>), five year project (2006 - 2011); Coordinator: Michal Borkovec, University of Geneva, Switzerland

C. Responses to FP7 calls:

There have been also a number of responses to the first year of the implementation of the new FP 7. Unfortunately the efforts by now are unsuccessful, one project is still waiting for a decision.

1. A proposal was submitted for call FP7-REGPOT-2007-3, Project title: “**Coordination and research infrastructure support in nanoscience – Western Balkans**”, Acronym: (CHRISTINWEB); Consortium: research groups from Bulgaria, Greece, Sweden, FYROM and Serbia; Participants from the Institute of Physical Chemistry: Vesselin Tonchev, Bogdan Rangelov, Stephan Armyanov, Alexander Milchev, Ivan Krastev, Dimitar Stoychev, Mikko Marinov, Valeria Stoyanova.
2. Project title: “**Nanostructured materials with tailored magnetic properties**”. The project was submitted for the call NMP-2007-2.2-2 of FP7; Name of the coordinating person: Pietro Luigi Cavallotti; List of participants: Politecnico di Milano., Dipartimento di Chimica, Materiali e Ing. Chimica “G.Natta” – POLIMI; Institute of Physical Chemistry, Bulgarian Academy of Sciences – IPC-BAS; Research Institute for Solid State Physics and Optics of the Hungarian Academy of Sciences – RISSPO HAS; Trinity College, The University of Dublin – TCD; Forschungsinstitut für Edelmetalle und Metallchemie – FEM; Falex Tribology N.V. – FALEX; Faculdade de Ciências, Universidade Do Porto – FCUP; Departament de Química Física, Facultat de Química, Universitat de Barcelona – UNIBA; Matrix Technology S.p.A. – MATRIX; BALLUFF GmbH – BALLUFF; CF consulting S.r.l – CFC.
3. Project title: “**Radically Innovative Cost Effective Coating Process to Introduce Breakthrough Surface Functionalities in Conventional Metallic Alloys to be Used in Water Hydraulic Applications Avoiding Oil Lubricants**”, Acronym: HYDRO-COAT, No: CP-FP 211667-2, Call: FO7-NMP-2007-SMALL-1, Project coordinator: Valeria Ferrando D’Appolonia S.p.A, Leading participant from IPC-BAS: Ivan Krastev
4. Project title: “**Natural co-Pigments as Innovative Colour-stabilising Agents for Anthocyanin-containing Foodstuffs**”, Acronym: COPIGMENT, Call: FP 7-SME-2007-1, Proposal ID: 222068, Project coordinator: Radoslava Nikolaeva Nara Geo Ltd. Bulgaria, Leading participant from IPC-BAS: Ivana Petkanchin

Ivan Krastev participated in the Meeting of the European Academy of Surface Technology in Schwaebisch Gmund, Germany. The Meeting made a decision for a preparation of a Cooperation project with a title: **“Nano-Structured Materials for Micro Electroforming”**. Among the participants in the meeting were: Prof. P.-L. Cavallotti – President of EAST (Politecnico di Milano, Italy), Prof. N. Spyrellis – Member of the Executive Board of EAST (National Technical University of Athens, Greece), Dr. A. Zielonka – Member of the Executive Board of EAST (Forschungsinstitut für Edelmetalle und Metallchemie, Schwäbisch Gmünd, Germany), Dr. J.-C. Puipe – Representative of the European Board in EAST (Steiger Galvanotechnique SA, Switzerland), Prof. W. Paatsch – Member of the EAST, representative for Germany (Bundesanstalt für Materialforschung und Prüfung, Germany), Prof. C. Mueller Jevenois – Member of the EAST, representative for Spain (Universitat de Barcelona, Spain), Prof. Olof Förse – Member of the EAST, representative for Finland (Helsinki University of Technology, Finland), Prof. I. Krastev – Member of the EAST, representative for Bulgaria (Institute of Physical Chemistry, Bulgarian Academy of Sciences, Bulgaria), Dr. M. Baumgärtner – General secretary of EAST (Forschungsinstitut für Edelmetalle und Metallchemie, Schwäbisch Gmünd, Germany), Dr. M. Griepentrog – Invited participant (Bundesanstalt für Materialforschung und Prüfung, Germany). The project was submitted to the current call of the FP7 of European Commission.

D. Responses to other calls (bilateral, NATO, etc.):

1. Project title: **“Formation and characteristics of porous electro- and photocatalytic coatings”**, Program: NATO Science for Peace (SfP), Project No. 977986, Project Co-Directors: Sotirios Sotiropoulos (NPD), Aristotels University of Thessaloniki, Greece
Stephan Armyanov (PPD), IPC BAS, Sofia, Bulgaria, Gianluca Li Puma, University of Nottingham, Nottingham, UK

2. Project title: **“Polymer and metal/polymer nanostructured materials for sensor applications”**, Program: Bilateral agreement for scientific exchange between DAAD, Germany and Ministry of Education and Science, Bulgaria, ID No: DAAD 08/2005, leading Bulgarian (IPC-BAS) partner: Vessela Tsakova, leading German partner: Vladimir Mirsky, University of Regensburg, Germany

3. Project title: **“Interrelation between foams, foam films and adsorption layers”**
Program: Bilateral agreement for scientific exchange between DAAD, Germany and Ministry of Education and Science, Bulgaria, ID No: DAAD 42/2005, leading Bulgarian (IPC-BAS) partner: Khristo Khristov, leading German partner: Reinhard Miller, Max-Planck Institute for Colloids and Interfaces, Berlin-Golm, Germany

4. Project title: **“Growth instabilities and structure formation in electrochemical systems far from equilibrium”**, Program: Bilateral agreement for scientific exchange between Ministry of Education and Science, Macedonia and Ministry of Education and Science, Bulgaria, ID No: BM 9/2006, leading Bulgarian (IPC-BAS) partner: Vesselin Tonchev, Macedonian partner: University of Skopje, Macedonia

5. Project title: **“Adsorption layer dynamics and foam film kinetics of micellar surfactant solutions”**, Program: Bilateral agreement for scientific exchange between DAAD, Germany and Ministry of Education and Science, Bulgaria, ID No: DAAD 16/2007, leading Bulgarian (IPC-BAS) partner: Elena Mileva, leading German partner:

Reinhard Miller, Max-Planck Institute for Colloids and Interfaces, Berlin-Golm, Germany

6. Project title: **“Layer-by-layer deposition of conducting polymer structures and of nanoparticles and conducting polymers for chemosensitive applications”**, Project 2007-DAAD-04; two year bilateral project (2007-2009); Participants: Vessela Tsakova (IPC-BAS, Sofia) and Vladimir Mirsky (University of Regensburg, Germany).

7. Project title: **“Nanostructured multicomponent systems as a basis of new functionalized materials”**, Project DFG-416-BUL 113/97); three year bilateral project; Participants: Ivan Krastev (IPC-BAS, Sofia) and Andreas Zielonka (Forschungsinstitut für Edelmetalle und Metallchemie, Schwäbisch Gmünd, Germany).

8 Project title: **“Study of nucleation processes in amorphous alloys and multicomponent glass-forming melts by composition-sensitive small-angle X-ray scattering techniques”**; Applicants: John Banhart (Technische University Berlin), Rainer Kranold (University Rostock), Stephan Armyanov (IPC-BAS, Sofia). The project is submitted to DFG and it is in a process of evaluation.

9. Project title: **“Nanomaterials for photochemical and photoelectron-chemical purification processes”**. Project Co-Directors: Sotirios Sotiropoulos (NPD), Aristotels University, Thessaloniki, Greece; Stephan Armyanov (PPD), IPC BAS, Sofia; Gianluca Li Puma, University of Nottingham, Nottingham, UK The project is submitted to Science for Peace (SfP)-982835 NATO and is on the stage of evaluation.

10. Project title: **“Self-organisation in the formation of ordered micro- and nanostructures from metals and semiconductors”**, Program : NATO reintegration grants, Researcher from IPC-BAS: Tsvetina Dobrovolska

E. Related activities:

1. Vesselin Tonchev has participated in an information meeting for launching the FP7 of the EC. The meeting was organized by the Ministry of Education and Science in Sofia, 31/01/2007÷01//02/20073.

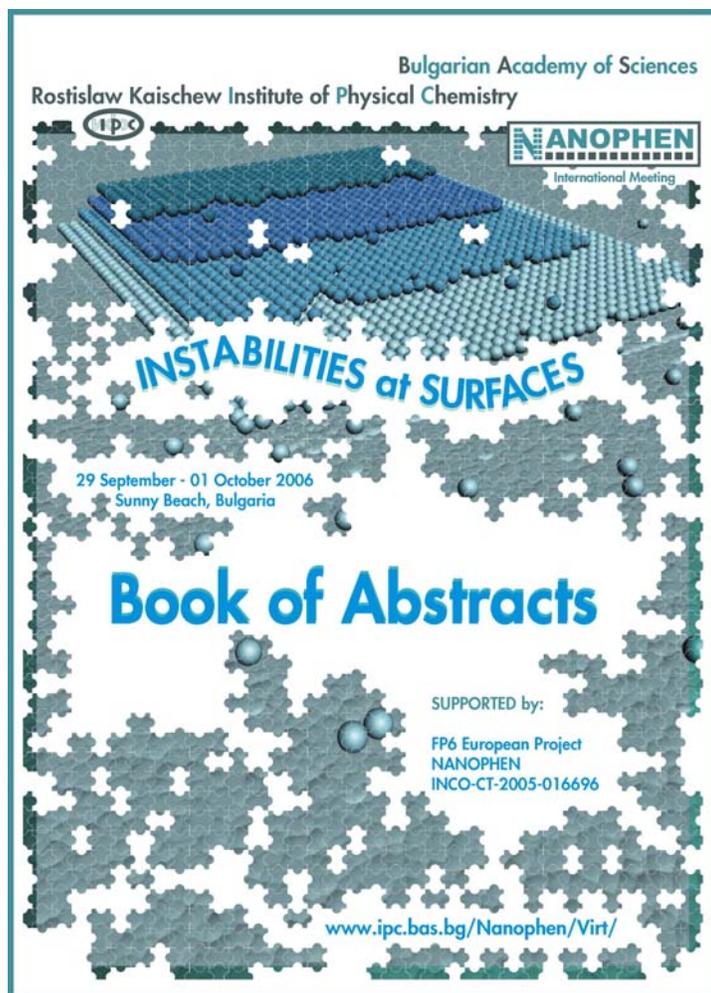
2. Ljubomir Nikolov has participated in a meeting of COST 43 in Berlin, April 2008, where the possibilities for participation in several future calls of NMP-Small have been discussed.

T 1-3: Organizing Virtual International Research Group (VIRT)

One of the important new initiatives within NANOPHEN project was to create on-line virtual medium for discussion, problem formulation and brain-storming, i.e. the establishment of **Virtual International Research Team (VIRT) (M 2, Appendix 1)**. VIRT was planned as a low-budget, virtual (ex-situ) scientific forum of people working in the field of surface instabilities and related topics. Also, it was intended to serve as a prototype for this specific type of scientific exchange in the other two priorities of NANOPHEN. The major activity of VIRT was concentrated in and might be followed on its web page <http://ipchp.ipc.bas.bg/Nanophen/Virt/index.html>. The site is under permanent development. Initially, the concept of VIRT was to create new channels for scientific collaboration and to integrate the efforts of various research groups working in the field of “Nanophenomena at surfaces during growth and evaporation of crystals” in order to enforce the efficiency of the research work. To realize this concept, several initiatives were planned and put into operation. First, a server was installed, which is used

for dissemination of information about the researchers active in the field (including affiliations and e-mail addresses) (**D 3**, Table 1, Section 3). This server is now used as a pool of unpublished lectures delivered at various summer schools and conferences. It also gives the titles and the bibliographic data of various publications (including very early ones), the titles of scientific books relevant to the field of VIRT, information on forthcoming workshops, conferences and meetings. Another aim of VIRT was to become an Internet-based communication tool for discussions and new-problem formulation. In this way, we expected to strengthen the existing contacts between the researchers in the thematic trend, as well as to attract new members. The goal was to enforce the collaboration between the experimental and theoretical groups, which could contribute to better understanding of the scientific problems in the selected field. An important aim of this initiative was to create a working Virtual International Research Team which to serve as a core team of a future integrated projects to be prepared and submitted for **financial support within the 7th FP of EC**. VIRT has operated successfully in the three years of NANOPHEN.

An essential part of the activity within the framework of this task was the **First non-VIRTual Meeting: “Instabilities at Surfaces”** that took place in the Black Sea resort “Sunny Beach” from September 29 to October 1, 2006. It was organized by Vesselin Tonchev, Bogdan Rangelov, Ivan Markov and Stoyan Stoyanov (the core team of VIRT). Thirty researchers from EU, Japan, USA, Russia and Canada have participated in the meeting, delivering talks and presenting posters, related to the field of surface instabilities.



The scientific program was focused on two problems: (i) strain-induced self-organization during semiconductor heteroepitaxy and (ii) kinetic step bunching and step meandering during sublimation and growth of crystals. New and interesting results have been reported and discussed, dealing both with experimental and theoretical aspects of these two problems. Some lectures devoted to the first problem should be specifically mentioned:

1. "Ge dots self-assembly on nanostructured substrate" by I. Berbezier and A. Ronda, L2MP – CNRS, Polytech Marseille, France
2. "Multiscale theory of self-organization on surfaces" by Dimitri Vvedensky, The Blackett Laboratory, Imperial College, London
3. "Growth and opto-electronic properties of Ge nanodots on ultrathin Si Oxide surfaces" by M. Ichikawa, University of Tokyo, Japan
4. "Low temperature kinetics in Pb/Si(111) nanostructures" by M. Tringides, Ames Laboratory, USA

These talks outlined the considerable progress in the field. In particular, the self-assembly of nanodots is also a subject of research interest in the Institute of Physical Chemistry in Sofia. So, this is a promising area of strong international collaboration in the future.

The second problem – step bunching during sublimation and growth - was discussed in several interesting lectures:

1. “How electromigration destabilization can be used for measuring the surface stress polar dependence” by P. Muller, J.J. Metois, A. Saul, Research Center for condensed matter and nanosciences, CNRS, Marseille, France;
2. “Step instabilities induced by drift of adatoms on Si(001) vicinal face” by M.Sato, Kanazawa University, Japan;
3. “Instability and dynamics of step bunching and meandering on a Si(001)growing surface” by A. Verga and T. Frisch, Institute for research on far from equilibrium phenomena, Marseille, France;
4. “Scaling and Universality in Step Bunching Models” by V. Tonchev from the Institute of Physical Chemistry, Sofia, Bulgaria.

These lectures addressed the specific problem of step bunching instability – a subject of intensive research in the Institute of Physical Chemistry in Sofia in the course of many years. Some recent results were presented by Bogdan Ranguelov in a poster entitled “Evaporation and growth of crystals – space and time periodicity in the dynamics of steps at vicinal crystal surfaces”.

The oral and poster presentations, together with the intensive numerous discussions during the non-Virtual Meeting have identified and clearly outlined the topics of the future development in both experimental and theoretical research work in the field. On this basis the participants talked about the possibilities to start closer collaboration and discussed the prospects of preparing joint research projects, to be submitted to the FP7 of the European Commission.

The meeting also provided a valuable possibility for young researchers from different countries to meet well-known scientists in the field of crystal growth and to communicate with them in a pleasant and friendly atmosphere. In this way the graduate students and the young researchers collected knowledge and enthusiasm necessary for their future work. Last but not least, the Book of abstracts (see Appendix I) (containing also a list of participants with their affiliations and e-mail addresses) provides in a condensed form the scientific reports presented and discussed at the Meeting.

The VIRT initiative already resulted in joint initiatives. During the second year of NANOPHEN, members of the VIRT group won a two-years bilateral grant for the project "Growth Instabilities and Pattern Formation in Electrochemical Systems Far From Equilibrium“ within the frame of Bulgarian-Macedonia Cooperation (project coordinators: V. Tonchev and B. Ranguelov).

T 1-4: Initiating new networks

The enhanced access to the research infrastructures in the MS partner institutions and participation of our scientists into international events (funded by NANOPHEN) helped for realization of new professional contacts with colleagues from research centers of similar profile in Member States.

The major initiative of IPC-BAS in the networking activities of project NANOPHEN was the implementation of **CONductive POLYmer EXpert (CONPOEX) Meeting**, held in Borovets, Bulgaria, April 17-20, 2008. CONPOEX Meeting was planned as a starting point for the building of a new European network in the interdisciplinary field of conducting polymers. This scientific field relates to the development of new organic and hybrid inorganic/organic materials, suitable for a great

variety of applications ranging from chemical and bio-sensors, organic electronic devices, batteries and supercapacitors to organic displays and optical devices.

CONPOEX Meeting aimed at (i) outlining the state of the art and important trends for future investigations in the field; (ii) identifying unsolved problems which could be addressed in a collaborative way; (iii) stimulating new cross-linking of scientific activities and mutual interest. The thematic scope of the meeting covered:

- synthesis (chemical and electrochemical) and characterization of conductive polymer (CP) materials
- modification of CPs with inorganic components (metal, carbon, semiconductor or insulator particles/structures)
- electroanalytic applications including sensors and biosensors
- electrocatalytic applications
- applications in organic electronic devices, actuators, batteries and supercapacitors
- applications in electrochromic and nonlinear-optic materials.

CONPOEX Meeting relied on the joining of complementary expertise and the exchanging of different viewpoints, and on a vivid discussion between leading European experts, active in the field. The preparation of this Meeting was realized with the help of Mikhail Vorotyntsev as an international advisor. M. Vorotyntsev is known for his expertise in the field of conductive polymers and successful efforts to consolidate the scientific community, engaged in the field, through the organization of a series of Workshops on Electrochemistry of Electroactive Materials (WEEMs). CONPOEX Meeting represented a further step in this direction due to the active and fruitful participation of the leading European researchers working on CP materials and their applications.



CONPOEX Meeting

April 17-20, 2008, Borovets, Bulgaria

CONDUCTIVE POLYMER EXPERT DISCUSSION MEETING



Organised by:
Vessela Tsakova
Institute of Physical Chemistry
Bulgarian Academy of Sciences
Sofia, Bulgaria

International advisor:
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LSEO-UMR 5188 CNRS
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*Supported by FP6 European Project NANOPHEN
INCO-CT-2005-016696*

CONPOEX Meeting brought together 18 high-ranked scientists coming from 10 European countries (Finland -1, France -2, Germany, -2, Hungary-2, Poland-3, Portugal-1, Russia -1, Spain-1, UK-1, Bulgaria -3). Between them were scientists with high positions in the European and national scientific structures, e.g. R. A. Hillman - president elect of International Society of Electrochemistry (ISE), G. Inzelt - head of Division I of ISE, L. Abrantes and P. Kulesza - national representatives of ISE of Portugal and Poland, respectively, A. Ivaska – president of the Abo Akademi Process Chemistry Center, Finland, all of them actively engaged in implementations within the

European Framework programs. Moreover, the Meeting was attended by 5 young researchers originating from the Bulgarian host research group and two collaborating research groups in Germany (University of Regensburg and Forschungszentrum Jülich). The complete list of participants is here attached.

The program of the Meeting was composed of several overview presentations focused on the current trends and problems in the specific research fields. In contrast to usual scientific conferences and workshops where the presentations are original and highly topical and look back to what has already been accomplished, CONPOEX Meeting contributions addressed generic fundamental challenges, future goals and aspirations not yet accomplished. The Meeting's program envisaged discussions after each interrelated group of overview presentations, with duration exceeding the time of the presentations. This structuring of the program contributed to intensive and efficient discussions resulting in the formulations of basic trends of future developments in the field. The participants suggested the future networking activities of the group to be coordinated by R. Hillman (UK), A. Ivaska (Finland) and V. Tsakova (Bulgaria). Their task will be to find and propose suitable frames (e.g. FP7 instruments, COST activities, bilateral projects etc) for further collaborations of the various groups, involved in the Meeting. Some of the participants in CONPOEX Meeting intend to apply for projects within FP7-NMP-2008-SMALL-NMP-2008-2.2-2 Nano-structured metamaterials (4.2.2 Knowledge-based smart materials with tailored properties) or FP7-NMP-2008-SMALL-NMP-2008-2.1-2 Processing and upscaling of nano-structured materials (4.2.1 Mastering nano-scale complexity in materials). An application for a bi-lateral collaboration project between one of the French partners (M. Jouini) and the Bulgarian host (V. Tsakova) was already submitted (in May 2008) within the program "Rila" for scientific exchange between France and Bulgaria.

The scientific program of the Meeting included also poster presentations of young researchers (3 PhD students and 2 young doctors) which provided them the opportunity for extensive discussions on their results with high-ranked experts in the field.





The expert level meeting, implemented in the frames of NANOPHEN project in Bulgaria, was based on a new concept for a scientific exchange. Following the way of summarizing existing achievements in the field, identifying new trends, and formulating further aims to be achieved, the participants were involved in a discussion on the future of this particular scientific field and its importance for the technology developments. The concept and the implementation of the CONPOEX meeting were highly appreciated by the participants. The meeting was considered as an important event for the focusing and strengthening of the European scientific interaction in this prospective from both fundamental and technological point of view field of research.

T 1-5: Participation in the activities of the National Center of Nanotechnology (NCNT)

IPC-BAS was a cofounder of **National Center of Nanotechnology** and traditionally researchers from IPC-BAS participate actively in its initiatives. Two members of the Project Core Team (Elena Mileva and Ivan Markov) are representatives of IPC-BAS in it, Elena Mileva is a Chairman of the Section “Bioinspired concepts and medical applications”.

During the first year of the NANOPHEN project two major events have been organized. The first initiative was “**National Day of Nanotechnology**” in June 2005 and was devoted to the promotion of the scientific activities of various research groups and institution in Bulgaria in the field of Nanosciences and Nanotechnologies. One of the basic lectures on this forum was delivered by Vessela Tsakova, Deputy Coordinator of NANOPHEN and the title was “**NANOPHEN: IPC-BAS in the European Research Area**”. The lecture may be found on the NANOPHEN web-site. The second event was the **7th NATIONAL WORKSHOP on NANOSCIENCE and NANOTECHNOLOGY**, which took place in November 24-25, 2005 in Sofia. Members of the Institute of Physical Chemistry participated actively in this workshop. One of the plenary talks was given by Stoyan Stoyanov. The title was “Nanoscale manipulation of crystal surfaces during growth and sublimation”. Another presentation

was made by Elena Mileva. The title was “Bioinspired concepts and medical applications of nanosciences”. The latter can also be found on NANOPHEN web-site. In addition, 9 posters were presented at this workshop by researchers from IPC-BAS on topics related to the scientific priorities of NANOPHEN.

During the second year two events have been organized by the NANOPHEN project. The first initiative was **Joint Meeting of the National Innovation Council and the Coordination Council of the National Center of Nanotechnology** on June 30, 2006 and was devoted to the promotion of the national policy in Innovations and the role of Nanosciences and Nanotechnologies. The Head of one of the Departments in IPC-BAS, Nikolay Boshkov has delivered an oral presentation “Ideas against corrosion”. A special information book was issued presented a range of research accomplishments in the field of NMP, related to direct application in industry and medicine (see Appendix 2). Several scientific groups from IPC-BAS have been presented in the book.

The next event was the **8th NATIONAL WORKSHOP on NANOSCIENCE and NANOTECHNOLOGY**, which took place in November 20-22, 2006 in Sofia. Members of the Institute of Physical Chemistry participated actively in this workshop. One of the plenary talks was given by Michail Michailov. The title of the talk was “Environment Dependent Interactions in Metal Monoatomic Layers- Real Physical Experiment and Computer Modelling”. Another plenary presentation was made by Christo Nanev: “Specifics of Protein Crystallization”. Elena Mieva has received a special gratitude from Prof. Iovka Dragieva for her work in the NCNT and for the organization and development of the activities in the Section in NCNT “Bioinspired concepts and medical applications”

In the last day, within the framework of the **INFO-DAY of 7FP**, Elena Mileva presented an overview of the project implementation: “NANOPHEN: Activities of IPC-BAS in NMP”. Her presentation was put on the web-page of the Ministry of Education and Science (http://www.nsfb.net/system/storage/INFO-DAY-22NO_06.pdf). In addition, one poster was presented at this workshop on a topic related to the scientific priorities of NANOPHEN: “Novel models of vicinal growth II” (Bogdan Rangelov, Vesselin Tonchev).

In the third year of the project implementation the National Center for Nanotechnology organized the **9th NATIONAL WORKSHOP on NANOSCIENCE & NANOTECHNOLOGY**, November 28-29, 2007. The members of the Institute of Physical Chemistry, Sofia, participated actively in this workshop. Vessela Tsakova Deputy coordinator of NANOPHEN presented a report on the practical implementation and aftermaths of the project NANOPHEN. The scientific program of the Workshop also included two oral and 6 poster presentations of colleagues of our Institute

WP 2: Upgrading key IPC BAS equipment and electronic communication tools

Task 2-1: Upgrade of key equipment

The activities in the first task of this work package have been focused on the upgrade of the unique, original and most widely-used scientific instrumentation in IPC-BAS. The aim was to allow focusing the IPC-BAS research on the priorities of

NANOPHEN, to ensure contemporary and competitive level of the original and unique instrumentation and to improve the external and the internal electronic communication system of IPC-BAS.

During the first year of project NANOPHEN three tender procedures for delivering of key equipment to IPC BAS were started. The three setups are:

- Scanning Electron Microscope with a device for Energy Dispersive X-ray Spectroscopy.
- Equipment for Differential Thermal Analysis and Thermo Gravimetry for high temperature measurements.
- Inverted video microscope with recording photo-metric device for measuring surface forces at liquid interfaces using micro-interferometric techniques.

Scanning Electron Microscope with a device for Energy Dispersive X-ray Spectroscopy (SEM-EDX System)

The old Scanning Electron Microscope (SEM) used in IPC-BAS until the middle of 2006 is JEOL JCSA-733 Super Probe which certificate of installation is dated 1979. Thus the existing in IPC-BAS SEM-EDS (Energy Dispersive X-ray Spectrometry) equipment was morally and physically old and its exploitation was repeatedly interrupted for numerous reparations. A lot of modules of SEM have been replaced by not original components. On the other hand, IPC-BAS has specialists in using similar equipment and capable to be trained for operating of the new SEM (JEOL 6390) with EDS (Oxford Inca Energy 350).

The new SEM is one of the most advanced in this type of microscopes (JEOL 6390). The main features of this equipment are as follow:

- System of digital technology, PC controlled, with fully automated electron gun;
- Resolution 3 nm at 30 KV;
- Friendly software with possibility to customize GUI;
- Eucentric Specimen Stage;
- EDX analysis of elements from Be to U;
- Option for future upgrade with WDS (Wavelength dispersive X-ray Spectrometry) when EDS and WDS will use the same GUI (graphical user interface);
- Improvement of Low kV Resolution.

The microscope was equipped with Oxford Inca Energy 350, which is the most advanced EDX system. It is compatible with JEOL 6390 and with a future WDS analytical system. In addition, they could be run under the same GUI. A Probe Current Detector with digital ammeter and a system for closed cycle of the cooling water for reduction of water consumption and for independence on the reduction of water pressure were included in the equipment. The Probe Current Detector is a device that measures the current of the primary electron beam and is controlled directly from the SEM user interface. Coupled with a digital ammeter it enables precise current monitoring during quantitative EDS analysis, thus allowing eventual fluctuations in the current to be compensated and the results corrected by the EDS software. This technique is used extensively in dedicated Electron Microprobes and the JSM-6390 is one of the few conventional SEM's on the market that can provide this facility.



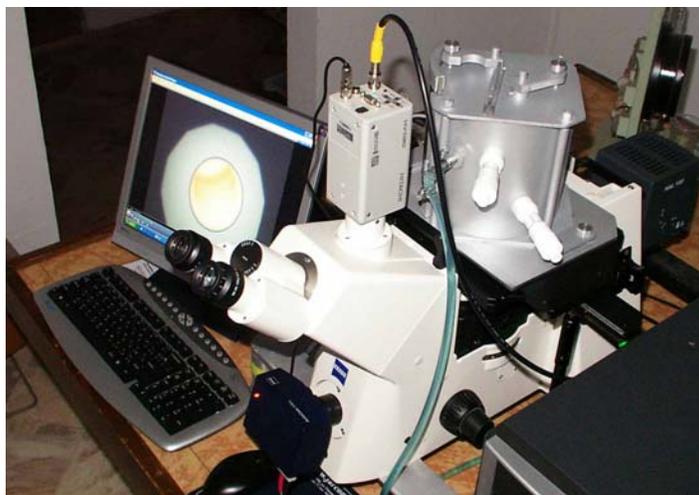
Scanning Electron Microscope with a device for Energy Dispersive X-ray Spectroscopy (SEM-EDX System) and the operator employed

The new facilities were put into action in June 2006 and they are applied for permanent control of samples, prepared in IPC-BAS and used in our own investigations and other European joint projects. Thus, it will ensure the compatibility with modern equipment in the other European countries. For this purpose a special room on the first floor of the building was equipped. Two operators received good training to operate and to work with the SEM equipment. One of them is a young scientist employed to work with the new equipment and paid direct by the NANOPHEN project since January 2006.

The new SEM equipment is now being used in full capacity.

Inverted Video Microscope with Recording Photo-Metric Device for Measuring Surface Forces at Liquid Interfaces using Microinterferometric Techniques

The new equipment is a high-quality inverted microscope (**Axiovert 200 MAT, Carl Zeiss**), which has additional modules, and allows the simultaneous visual and video observation, as well as the photometry and digital registration of the thin liquid films images. The microscope was delivered and put into action in September 2006. It is equipped with a photometric device with high sensitivity (50 A/lm), a high-resolution digital camera (AxioCam HRm), supplied with specific image analysis software (AxioVision), and a high-quality (3 CCD) video camera (HV-D20R, Hitachi) for imaging of the thin liquid films in real time. With the new equipment the unique Bulgarian experiments in the field of thin liquid films are lifted on a new more reproducible and more precise experimental level.



Inverted Video Microscope with Recording Photo-Metric Device for Measuring Surface Forces at Liquid Interfaces using Microinterferometric Techniques

Equipment for Differential Scanning Calorimetry with Additional Module For High Temperature Measurements

The new equipment is a **Pyris Diamond TG/DTA** apparatus from **Perkin Elmer**. The new instrument is a combined DTA (Differential Thermal Analysis) and TG (Thermo Gravimetry) module. With the new equipment it is possible to cover the temperature interval from -65 °C to 1500 °C. The combined instrument permits the simultaneous investigations of the energy effects and the changes in the weight of the sample. Thus, the phase transitions are easily distinguished from chemical reactions.

Temperature Range	Ambient to 1500°C
Automatic Cooling Unit	Forced Air Cooling
Cooling Time	1 000°C to 50 °C within 15 min
Balance Type	Horizontal Differential Type
TG measurement Range	200mg (0.2µg)*
DTA Measurement Range	+/- 1000µV(0.06µV)
Programmable Rate	0.01 – 100 °C/min
Sample Pan Material	Platinum , Aluminum, Alumina
Sample Pan Volume	Standard 45µl Optional 90 µl
Atmosphere	Air, Inert Gas, Vacuum (10 ⁻² Torr)
Purge Gas Flow Rate	0-1000 ml/min

The apparatus was delivered in June 2006, several members of the staff of the Department “Amorphous materials” in IPC-BAS were trained to operate with the new equipment, and it was put into action in June 2006. The results obtained with this equipment are very important and are already being used in other joint European projects . The major characteristics of the apparatus are summarized in the following table:



Equipment for Differential Scanning Calorimetry –Additional Module for High Temperature Measurements

Task 2-2: Upgrading IPC-BAS electronic communication system

The second task in WP 2 was related to the renewal of the Institute electronic communication system. The old IPS-BAS Intranet was based on coaxial cable loop, included bunches of nonstandard UTP cables and dated back to 1994. Later, hubs were introduced and the system has been many times expanded and upgraded. The technical condition and the potential of the system were completely outdated. Thus, the transfer rate was about 10 Mbps. There was also a firm limit of only 70 static IP addresses. The server itself was very old-fashioned and was not protected by any antivirus system. Therefore, very often the total system was being infected. The organization of the old Intranet architecture did not allow connections to some remote offices and laboratories (in particular those situated in the basement or on lower flows of the building). So, it turned out that such an Intranet system could neither be improved, nor upgraded any further. The funds initially foreseen however, were insufficient for a new LAN system. This problem was resolved by transferring the funds that we have managed to save from the experimental equipment upgrade, into the construction of a totally new and contemporary LAN system. The respective permission for fund relocation was duly obtained.

Certificated structured cabling system and LAN were developed in IPC-BAS. The LAN is characterized with 100 Mbps velocity, reliability and flexibility. The equipment is provided by world-wide firms with best quality for up to 144 workstations (separated micro computers) placed on 5 floors and basement. The structured cabling system is based completely on Reichle & De-Massari components. This firm is one of the famous manufacturers in the world. It is used category 5E copper network cable.

Both passive and active equipment of the LAN start from common communication Rack box. The cable is in the cable channels mounted on the walls. The passive equipment in the box includes 3 patch panels, each with 48 ports, as well as patch cable guiders. The active equipment in the box includes 3 CISCO Systems switches. Each of them has 48 x 10/100 Mbps ports and additional 4x1 Gbps ports for connection of servers and/or power users. The switches support VLAN, QoS (quality of service) and remote control via WEB interface, SNMP and/or RMON and suitable tools for security. Except in the RACK the active equipment of the LAN includes Fujitsu Siemens Econel

200 server, CISCO Router-Firewall-VPN Concentrator and 5 Linksys Wireless-G network wireless access points with 10 USB 2.0 CANOYN wireless adapters.

The main characteristics of the active equipment are the follows:

1. Switch - Linksys 48x10/100, 4x1 Gbps, 2x Exp.Slots. The switch is rapid, reliable and has enhanced security for local network with flexible possibilities for function control. Each switch has 48 10/100 Mbps ports, 4 10/100/1000 Mbps ports, 2 mini GBIC expansion slots. The control of the switch is realized via SSL-crypt Web interface or via SSH console (SNMP or RMON). The access security is 802.1x with RADIUS user authentication. There is a possibility for MAC address filtering. The Linksys switch also provides QoS functions (IGMP snooping, L2/L3 COS, queuing & scheduling) for real-time applications as well as voice and/or video transfer and VLAN support (Port-based and 802.1q-based) up to 256 points.

2. Router/Firewall/VPN Concentrator - CISCO 1800 Security Router. It is Cisco 1800 dual Ethernet security router with V92 backup. The Cisco router provides secure broadband access with concurrent services for branch offices, integrated V92 analog or Ethernet backup port for redundant WAN links and load balancing. Advanced security of the router includes: state full inspection firewall, IP Security VPN (Triple Data Encryption) standard or advanced encryption standard [DES, 3DES, AES 128, AES 192, and AES 256] hardware acceleration (on motherboard), intrusion prevention system, antivirus support through Network Admission Control, enforcement of secure access policies, 8-port 10/100 managed switch with VLAN support and Power over Ethernet, 2-port 10/100 WAN, 1 port for auxiliary and console, easy deployment and remote-management capabilities through Web-based tools and Cisco IOS® Software Advanced IP services 12.3(8) YI.

3. Server - FS Econel 200 with the following characteristics: CPU - 1x XEON 2.8 GHz, L2 - 1MB ECC Cache; FSB: 800 MHz; Intel E7320 chipset; 512MB/4096 MB Max; ECC DDR1-333 SDRAM; HDD Desktop SEAGATE Barracuda 7200.9 250GB, 7200rpm 8MB cache Serial ATA II-300; PC2700 memory scrubbing; Chipkill™ support; 4 channel SATA I/O adapter; CD/DVD, FDD; 10/100/1000 Mbps LAN; 4 x 64 bit 33 MHz PCI slots; ATI Rage XL with 8MB SDRAM video.

4. UPS - APC Smart UPS 1500VA, Power Chute Plus with: interface port: DB-9 RS-232, smart slot, USB ports, power chute smart - UPS bundle software, output power capacity - 1.500 VA, nominal output voltage: 230 V, output voltage note can be configurable for 220, 225, 230 or 240 V, backup time at half load for 26.5 minutes (490 Watts), backup time at full load for 7.4 minutes (980 Watts), battery type - maintenance-free sealed lead-acid battery with suspended electrolyte, leak proof replacement battery cartridge (1) RBC24.

5. Wireless components: Linksys Wireless-G Network Access Point; Wireless IEEE 802.11g 2.4 GHz, 54Mbps;- USB 2.0 Adapter CANOYN Wireless IEEE 802.11g USB 2.0

6. Antivirus software insurance. The Grisoft antivirus software is selected because AVG is in the top 10 antivirus programs in the world. The software provides whole protection of the computer as well as e-mail on line, significant rapid reaction for new viruses and steady work without decreasing of any computer system efficiency.

AVG Linux Email Server Edition is intended for one server protection without mailbox limit. Total number of workstation installations is up to 150. License is valid for 2 years. AVG update and protection are provided via AKAMAI for each client,

technical support - via e-mail. AVG Control Center is mounted on separated computer (so called administrative console) and operates on line with the whole local network and/or with individual workstations. So, the triple antivirus protection enables – for the server, for the whole local network and for each single computer in the net. There is also a possibility for cost reduction for renewing of license after dead time. AVG Network Edition Clients includes e-mail scanner, resident shield, virus vault, administrative control center, testing interface, scheduler, update and alert manager.

Both, the certificated structured cabling system and local area network, allow reliable, rapid and comfortable work to all users in IPC-BAS and to receive the new challenges of continuously developed IT matter.

WP 3: Creating new career prospects for young researchers

The Institute of Physical Chemistry has unique and original instrumentation and a considerable number of internationally recognized scientists, able to guarantee the successful development of prospective young scientists in the thematic priorities of NANOPHEN. In the last decade however, the age misbalance in IPC-BAS grew up significantly. Due to various reasons, mainly economic, a large portion of our young researchers “drain” abroad or find work in home-country companies, often being engaged in activities that are quite far from their initial scientific qualification. So, one of the basic aims of NANOPHEN was to implement a series of measures so as to attract talented young specialists and to offer a suitable background for their career perspectives at IPC-BAS. The NANOPHEN activities were focused on the following efforts:

- to find the appropriate number of prospective young specialist and to ensure reasonable financial support for their career development
- to elaborate coherent program for advanced training of young researchers and engineers in the scope of the thematic priorities of IPC-BAS
- to provide opportunities for additional training in MS laboratories

The basic goal was to **attract and keep talented young researchers** by creating better working conditions for them in IPC-BAS. The tackling of the problem went on two major trends: **opening new job positions** for young chemists and physicists and **ensuring a high-level advanced training-through-research program**.

T 3-1: Creating new job opportunities and better working conditions

To hire new prospective researchers and to find talented PhD students has turned to be a more difficult task than we have initially expected. The reasons are many incl. the low overall number of students in chemistry and physics in the country; financial difficulties, etc. So, we had to look for more diverse approaches to this serious problem. One option was to intensify the formal and informal contacts with the University authorities and students on undergraduate level. Another option was to be more “aggressive” in advertising the improved working conditions and career perspectives in the IPC-BAS as a Center of Excellence in the field of Nanoscale Phenomena.

Thus, several **new job positions** for researchers, at the age below 30, were opened in IPC-BAS.

- The physicist **Dimitar Vassilev** was appointed in the Electron Microscopy Laboratory to work with the new apparatus, supplied by the funds of NANOPHEN.
- The second appointment was of the chemist **Ivan Pigov**. He was a PhD student in the Department of Interface and Colloid Science and has just finished the experimental work on his thesis.
- The physicist **Kamelia Kamburova** and the chemist **Georgy Gochev** were hired at the beginning of 2007 till the end of the project. They were PhD students in the Department of Interface Science and Colloids, finishing the experimental work on their theses. Both take active part in the research and training programs of NANOPHEN. K. Kamburova was awarded as a prospective young researcher of IPC-BAS in 2006.
- In the second year of the project implementation the chemist **Svetoslav Ivanov** was hired for the same reason. S. Ivanov was a PhD student in the Department of Amorphous Materials. The subject of his thesis was changed two years ago and he is also in a need of time to accomplish the work.
- **Anelyia Stoyanova** was hired on a half position from May to July, 2006 being a student in chemistry. She prepared a diploma work entitled “Glucose oxidation and nitrate ions reduction on copper modified polyaniline layers” under the guidance of a senior researcher of IPC-BAS and her contract was extended after graduating chemistry at University of Chemical Technology and Metallurgy.
- Another fresh graduate from Sofia University **Vladimir Lyutov** was directed to IPC for preparation of a diploma work and then was appointed for one year with prospects to continue his education as a PhD student in one of the main thematic priorities of this project. V. Lyutov was awarded the best diploma work prize(2007) of The Union of chemists in Bulgaria.
- The biochemist **Svetla Nineva**, who graduated at the Sofia University, was hired in the Department of Electrochemical Deposition and Dissolution of Metals and Alloys

Besides these totally new job openings for young graduates, in IPC-BAS there is a number of skilled young researchers. Although they are fully engaged with scientific research, for administrative and budgetary reasons they still hold inadequate positions for the moment (pertain formally to the non-scientific staff). So, it was decided to pick out of this group those youngsters who are most qualified, promising and able to continue the strong traditions of the Institute. Thus, several young specialists from IPC-BAS have been offered additional contracts related to specific scientific research activities. Four of them have already been distinguished with the Institute Prize for young researchers in the years 2005 and 2006; other four have received their PhD degrees at the end of 2005, the beginning of 2006 and in 2007 (Viktoria Milkova, Plamen Tchoukov, Svetlozar Ivanov, Ivajlo Dimitrov); several others are in the process of writing their PhD theses (Kamelia Kamburova, Jaklin Yaneva, Georgiy Gochev).

1. Viktoria Milkova, PhD, Dept. Interface and Colloid Science

“Formation of multilayer films from poly(styrene sulfonate) and poly(allylamine hydrochloride) on oxide nanoparticles”

“Formation of the multilayers from biopolymers on colloidal particles at high ionic strength”

2. Svetlozar Ivanov, PhD, Dept. Phase Formation and Crystal Growth
“Electrochemical formation and characterization of composite layers based on metal oxide nanoparticles incorporated in polyaniline (PANI) coatings”
“Multiple deposition of thin polyaniline layers and metal nanoparticles by LbL self assembly”
3. Ivaylo Dimitrov, PhD, Dept. Phase Formation and Crystal Growth
“Biological and physicochemical treatment in protein crystallization”
“Crystallization of apoferritin/ferritin in temperature gradient at high non-denaturing temperatures”
4. Plamen Tchoukov, PhD, Dept. Interface and Colloid Science
“Drainage kinetics of nanofilms from solutions of tetraethylenglycol monododecyl ether”
5. Jacqueline Yaneva, chemist, Dept. Amorphous Materials
“Dynamics of polymer chains in nanodroplets forming liquid bridges in chemically structured slit pores”
6. Vladimir Lyutov, PhD student, Dept. Phase Formation and Crystal Growth
“Metal particles electrodeposition in multifunctional layers of PANI/PAMPSA”
7. Feyzim Hodjaoglu, PhD student, Dept. Phase Formation and Crystal Growth
“Influence of capillary and hydrostatic pressure on lysozyme crystallization”
8. Hristina Petkova, PhD student, Dept. Interface and Colloid Science
“Electric surface properties of thin liquid (nano) films stabilized by polyoxyalkylate based polymeric surfactant”
9. Marina Arnaudova, chemist, Dept. Electrochemically Obtained Materials and Corrosion Processes
“Electrodeposition and characterization of Ni-based alloys”
10. Hristina Popova, PhD student, Dept. Amorphous Materials
“Adsorption of self-avoiding tethered membranes - A Monte Carlo simulation study”
11. Rossen Christov, PhD student, Dept. Interface and Colloid Science
“Investigation of carboxymethylcellulose adsorption on aluminium oxide nanoparticles and its influence on their optical properties”
12. Anna Gyurova, PhD student, Dept. Interface and Colloid Science
“Influence of ethanol on the interface electric polarizability of bacteria E. coli”
13. Nelly Tzvetkova, chemist, Dept. Electrochemically Obtained Materials and Corrosion Processes
“Corrosion characterization of conversion coatings for Zn and Zn-Co obtained from environmentally friendly solutions without Cr⁶⁺ ions”
14. Dimitrinka Arabadzhieva, chemist, Dept. Interface and Colloid Science
“Drainage of foam films from pentaethylene-glycol-mondodecyl ether”

It should be noted that a number of papers have already been published or are in stage of preparation for publication, and all are related to the scientific tasks in the contracts of these young researchers (see also Appendix 1).

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5. A. Stoyanova, V. Tsakova, "Electrooxidation of ascorbic acid and dopamine on poly-3,4-ethylenedioxythiophene" in "Nanoscale Phenomena and Structures", edited by D. Kashchiev, Prof. M. Drinov Publishing House, Sofia, 2008, p. 297-300.
6. R. Miller, V. Alahverdjieva, D. Arabadzhieva, R. Todorov, Cs. Kotsmar, J. Krägel, P. Tchoukov, E. Mileva, Kh. Khristov, D. Exerowa "Impact of surface dynamics and rheology on foam formation and stability" in "Nanoscale Phenomena and Structures", edited by D. Kashchiev, Prof. M. Drinov Publishing House, Sofia, 2008, p. 127-134.
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10. V. Stoyanova, M. Marinov, Ts. Tsacheva, D. Vassilev, T. Kупenova, J. Fisak, D. Rezacova, P. Choupecky, "Heavy-metal particles in atmospheric dusts collected by dry-filter techniques: electron microscopy analysis" in "Nanoscale phenomena and structures", Ed. D. Kashchiev, Prof. Marin Drinov Publishing House, 2008, p. 121-124.
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12. S. Ivanov, V. Mirsky, V. Tsakova, "Multilayer adsorption PANI-PSS coatings. Electrochemical properties and analytical application" Ed. D. Kashchiev, Prof. Marin Drinov Publishing House, 2008, p. 289-292.
13. V. Lyutov, V. Tsakova, "Effect of anions on the electrochemical synthesis, stability and surface morphology of polyaniline films" in "Nanoscale phenomena and structures", Ed. D. Kashchiev, Prof. Marin Drinov Publishing House, 2008, p. 293-296.
14. R. Lukanova, E. Stoyanova, D. Stoychev, "Studies of the formation of ceria-based protective films as alternative of Cr⁶⁺-based ones on aluminium" in "Nanoscale

- phenomena and structures”, Ed. D. Kashchiev, Prof. Marin Drinov Publishing House, 2008, p. 301-304.
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 16. K. Kamburova, Ts. Radeva, “Electro-optics of colloid-polyelectrolyte complexes: Counterion condensation on free and adsorbed sodium carboxymethyl cellulose” J. Colloid Interface Sci. 313 (2007) 398-404.
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 21. S. Nineva, Ts. Dobrovolska, I. Krastev, “Electrodeposition of silver-cobalt alloy coatings: Part 1 – Cyclic voltametry”, in preparation.
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T 3-2: Probing a pilot program for coupled multidisciplinary training and fundamental knowledge on nanoscale phenomena

The present scientific staff of IPC-BAS includes about 30% younger scientists at the age below 35. One of the basic aims of NANOPHEN project was to elaborate a coherent program for multidisciplinary training of these young researchers and engineers in the scope of the thematic priorities of the Institute. The strategic goal was to ensure an intensive and advanced teaching of the created core team of young scientists in the field of nanoscience and nanomaterials, so as to sustain the good tradition of high-quality research in IPC-BAS.

In the first six months of the project implementation, a **Strategy for coupling multidisciplinary practical training and gaining of fundamental knowledge in the field of NANOPHEN priorities** was elaborated (M 4, Table 2, Section 3). A **Coherent Program of the Lecture Series on Nanoscale Phenomena in Bulk and Surface Phases** was presented separately (D 4, Table 1, Section 3). According to this Program a **Pilot Program for advanced training of young researchers and PhD students** was

designed. The whole program of these events is presented in Deliverable 9 (see **D 9**, Table 1, Section 3). The Pilot Program was composed of two stages.

The first stage comprised **8 lectures on 5 themes**, delivered by the members of International Expert Group. These presentations dealt with the contemporary approaches and the developments in the partner laboratories in the thematic priority of the project, and deliberated on “hot topics” of nanoscience and nanotechnologies. This stage took place in May 12-13, 2006.

NANOPHEN 6
Sixth Framework Programme

Pilot Program for Coupled Multidisciplinary Training and Fundamental Knowledge on Nanoscale Phenomena

First Stage, May 12-13, 2006, IPC-BAS, Sofia

May 12, 2006

9:30-10:30 **Claudine Buess-Herman (Belgium)**
Nanostructured surfaces for electrocatalysis

10:30-12:30 **Joachim Krag (Germany)**
Introduction to steps dynamics and steps instabilities

14:00-16:00 **Reinhard Miller (Germany)**
Dynamics of adsorption of surfactants, polymers and their mixture

Characterization of liquid-liquid interfaces

May 13, 2006

9:30-11:30 **Kurt Binder (Germany)**
Statistical thermodynamics of nucleation phenomena and the significance of spinodal curves: status and perspectives

11:30-12:30 **Andreas Zielonka (Germany)**
Electrochemical processes for nanostructured materials

Lecture Hall at IPC-BAS, Acad. G. Bonchev str., bl. 11

Bulgarian Academy of Sciences

Rostislav Kalschew Institute of Physical Chemistry

PILOT PROGRAM FOR COUPLED MULTIDISCIPLINARY TRAINING AND FUNDAMENTAL KNOWLEDGE ON NANOSCALE PHENOMENA

19 February (Monday)

10:15-11:00 TOP AGGREGATION OF BISTHILAR KAGOME LATTICES IN THE STUDY OF DYING MOLECULES AND GROWTH PHENOMENA, I. LINDRE, A. LOZANOV, C. DIMITROV

10:30-11:00 ELECTROCHEMICAL BEHAVIOR OF POLYMER NANOPARTICLES, S. S. S. S. S.

14:00-16:00 NUCLEATION AND GROWTH OF CRYSTALS, I. I. I. I. I.

20 February (Friday)

10:30-11:30 ELECTROCRYSTALLIZATION, SELECTIVITY AND GROWTH OF NANOCRYSTALS, A. A. A. A. A.

21 February (Wednesday)

10:30-12:00 THERMAL AND CRYSTALLIZATION PROCESSES IN QUANTUM DOT SYSTEMS, I. I. I. I. I.

22 February (Thursday)

10:30-12:00 CRYSTALLIZATION OF PROTEINS, C. C. C. C. C.

25 February (Monday)

10:30-12:00 LIQUID NANOPHASES, B. B. B. B. B.

27 February (Tuesday)

10:30-11:00 COMPLEXES, B. B. B. B. B.

28 February (Wednesday)

10:30-12:00 NON-EQUILIBRIUM ELECTROCHEMISTRY FOR CHARACTERIZATION OF NANOSTRUCTURES, S. S. S. S. S.

31 March (Thursday)

10:30-12:00 NON-EQUILIBRIUM ELECTROCHEMISTRY FOR CHARACTERIZATION OF NANOSTRUCTURES, S. S. S. S. S.

41 March (Friday)

10:30-11:00 COMPUTER MODELING OF NANOSCALE SYSTEMS IN CHEMISTRY, A. A. A. A. A.

45 March (Monday)

10:30-12:00 ELECTROCRYSTALLIZATION IN THE PRESENCE OF SURFACTANTS, D. D. D. D. D.

6 March (Friday)

10:30-11:00 GROWTH OF NANOPARTICLES, T. T. T. T. T.

10 March (Wednesday)

10:30-12:00 THERMAL PROCESSES, I. I. I. I. I.

NANOPHEN **FP6 European project** **NANOPHEN**
INCO-CT-2005-016696

The second stage of the Pilot Program was performed in February-March, 2007. It included **34 lectures on 14 topics**, devoted to the presentation of most important achievements and recent results in IPC-BAS in the field of the nanoscale phenomena and structures and their applications in the practice. The lectures were prepared by **16 senior scientists from IPC-BAS**. Beside the lectures, additional training-through-research program was implemented, consisting of **32 academic hours of demonstration experiments** and training in **8 of the leading laboratories of IPC-BAS**. Most of the young scientists had the opportunity to present their own work and to demonstrate the experimental skills during the practical courses. This helped to promote informal discussions among the participants and lecturers and thus expanded the participant’s expertise of their particular subject area. Two books of abstracts, of the lectures and of the laboratory demonstrations were prepared and given to each attending the activities.



ROSTISLAV KAISCHEV INSTITUTE OF PHYSICAL CHEMISTRY
BULGARIAN ACADEMY OF SCIENCES

POSTER SESSION

APRIL 21, 2007

"BOTZMANN" HALL, IPC-BAS, 15:30-17:30

PILOT PROGRAM
FOR COUPLED MULTIDISCIPLINARY TRAINING AND
FUNDAMENTAL KNOWLEDGE ON NANOSCALE PHENOMENA

TOPICS:

- NUCLEATION AND GROWTH PHENOMENA IN CRYSTAL AND AMORPHOUS MATERIALS
- INTERFACIAL PHENOMENA IN COLLOID SYSTEMS
- KNOWLEDGE-BASED MULTIFUNCTIONAL NANOMATERIALS WITH DIRECT INDUSTRIAL UTILIZATION



FP6 EUROPEAN PROJECT
INCO-CT-2005-016696



The Pilot Program activity was completed with a **special poster session** during the Second NANOPHEN Annual Meeting. The poster presentations were prepared by the young scientists, participating in the Pilot Program and showed the results of their current scientific research. The poster program is presented in Deliverable 9.

This program offered a wide range of opportunities and was open to the researchers from other (similar) institutions, companies, etc. Its schedule was widely announced to other scientific institutions and via the National Expert Council of Nanotechnologies to the wider nanoscience community and general public. On average, 45 young researchers and PhD students (per session) attended this program, among them 30 participants from IPC and more than 100 from other institutes and universities in Sofia.

Owing to the excellent work of the task managers, the planned actions were accomplished successfully and, according to the opinion of the young participants, the Pilot Program offered a wide range of opportunities for in-depth discussions on different research problems. Thus the overall estimation of this initiative was very high.

A **Book** of all the lectures (**D 13**, Table 1, Section 3) was issued. It was distributed among the participating laboratories and is now used in the further development of this training-through-research program in IPC-BAS.

T 3-3: Participation of young researchers in training courses and summer schools in MS partner institutions and hosting renowned scientists for co-tuition and training

Another important element of creating better working conditions for the young scientists quite important is the possibility to participate in scientific meetings and schools so as to give them a chance to establish contacts with scientists from abroad. This option is particularly essential for the proper development of the PhD students.

During the implementation of the project NANOPHEN several PhD students of IPC-BAS were funded by and they participated in EU Schools:

1. Svetoslav Ivanov, a first year PhD student in the Department of Amorphous Materials, was helped to participate from 11 to 19 July 2005 in “2005 Methods in Molecular Simulation Summer School”. The School was organised by the University of Cardiff, Cardiff, Wales and included lectures and practical sessions for training young European researchers that work in the field of computer simulation methods.

2. Georgy Gochev, a last-year PhD student in the Department of Interfaces and Colloid Science, took part in the Winter School “Fluid Foam Physics: a Model for Complex Systems”, Ecole de Physique, Les Houches, France 9-20 January, 2006. He had an oral presentation entitled “O/W Emulsion Films from Polymeric Surfactants Based on Inulin”. More details can be found on NANOPHEN web-site.

3. Feyzim Hodjaoglu, a second year PhD student in the Department of Phase Formation and Crystal Growth, took participation in the Crystallization Course of FEBS (Federation of European Biochemical Society) “Advanced methods in protein crystallization II” in Nove Hradý (Czech Republic) from 6 to 13 October, 2006. He has presented a poster “Unconventional methods in protein crystallization”. The report of F. Hodjaoglu, presented after finishing the school, describes in detail the benefit derived from this school for his skills in the specific area of the protein crystallization.

4. Vladimir Lyutov, former chemist and now PhD student in the Department of Phase Formation and Crystal Growth has attended the “Autumn School on Materials Science and Electron Microscopy” in the Humboldt University of Berlin, Institute of Physics, Germany in the period of 6÷12 October 2007. He presented a poster: “Electrochemical synthesis and characterization of polyaniline in presence of 2-acrylamido-2-methyl propanesulfonic acid and its polymer”.

5. Svetla Nineva, a chemist in the Department of Electrochemical Deposition and Dissolution of Metals and Alloys participated in MINDE (Micro and Nano Deposition) COURSE ATC3 together with EUROINTERFINISH 2007, at the National Technical University of Athens, Greece during 14÷19 October 2007.

6. Feyzim Hodjaoglu, being a third year PhD student in the Department of Phase Formation and Crystal Growth has visited for a short term (13÷22 July 2007) the Institute of Analytical Chemistry, University of Regensburg, Germany, for gaining new experimental experience in “Crystallization of proteins in the presence of gold nanoparticles”.

7. Hristina Popova, a third year PhD student in the Department of Amorphous Materials has attended “Methods in Molecular Simulation Summer School 2007” at the University of Sheffield, England in the period of 8÷17 July 2007. She presented there a poster: “Structural and Dynamic Properties of Tethered Membranes: A Monte Carlo Simulation Study”

8. Viktoria Nakova, a fresh PhD in the Department of Interface and Colloid Science attended “Spring School in Colloid Science” at the University of Bristol, England in the period of 7÷11 April 2008.

9. Hristina Petkova, a first year PhD student in the Department of Interface and Colloid Science attended “Spring School in Colloid Science, University of Bristol, England in the period of 7÷11 April 2008.

10. Rossen Christov, a first year PhD student in the Department of Interface and Colloid Science attended “Spring School in Colloid Science, University of Bristol, England in the period of 7÷11 April 2008.

The PhD students have also been very active in participating in the workshops and the conference, organized by IPC-BAS. And not only helping with the organization and accommodation of the participants, but also presenting posters and being coauthors of many of the delivered oral presentations (see also the report on **T-4-2**).

WP 4: Dissemination of knowledge

The major goal of the activities in this workpackage was to diffuse and exploit research results, to discuss and address new ideas and to coordinate future actions performed in collaboration with Member States partner institutions, to escape from the previous tendency of capsulation of the scientific research and to prepare acting on an equal base in the European Research community, to intensify the scientific contacts and the exchange of results via enhanced mobility of scientists.

T 4-1: Organization of exploratory workshops and international conference

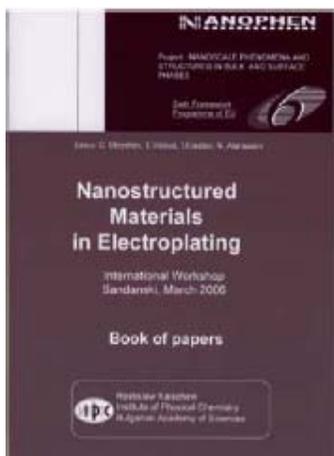
Special emphasis in this workpackage was set on the organization of **exploratory workshops** focused on transfer of knowledge, accumulated via the research activities in IPC-BAS and on intensifying the collaborations of our scientific staff with MS research teams in the NMP area. These events were aimed at presenting and promoting the scientific achievements of IPC-BAS in the field of nanoscience and nanomaterials before the scientific community and potential industrial users, as well as to outline the actual state of art of the nanotechnologies in the country. The idea was to provide a possibility for all members of the research staff of IPC-BAS to participate in a thematically appropriate workshop and to give talks or present posters. An important additional expectation was that young researchers from IPC-BAS would have a chance to create professional contacts with well-known scientists from EU countries.

On the whole three international exploratory workshops and one International conference have been organized.

The first NANOPHEN International Workshop “**Nanostructured materials in electroplating**” was held in the town of Sandanski, in March 25-30, 2006. The event was announced on IPC web-site: <http://www.ipc.bas.bg/confer/NME2006/index.html>. The Workshop was attended by 50 participants, including 15 participants from eight European countries, namely Germany, Italy, Spain, Greece, Belgium, UK, Austria and Hungary. Among the Bulgarian participants 25 were from IPC-BAS and 10 from other

Bulgarian research institutes, universities and industrial laboratories. The lecturers selected by the Organizing Committee were experts in the field of electrochemical production of nanostructured materials and presented the newest approaches, results and achievements in the field. Among the foreign participants in the Workshop were Prof. Pietro-Luidgi Cavallotti, Prof. Walther Schwarzacher, Prof. Nicolas Spyrellis, Prof. Imre Bakonyi, Prof. Carlos Mueller, Dr. Andreas Zielonka. Beside prominent scientists from the universities of Athens, Barcelona, Milan, Saarbrucken, Ilmenau, Brussels, etc., there have also been representatives from Bulgarian galvanotechnic enterprises.

There have been presented 11 invited lectures by foreign participants and 8 talks by Bulgarian scientists. In the poster sessions, 29 posters were presented and discussed. The topics of the conference covered a wide scope of trends on nanostructured materials in galvanotechnics, like electrodeposition of coatings on microstructured substrates, composite and nanocomposite coatings (Prof. Jakob, Dr. Petzoldt), multilayers with sublayers of nanometer thickness (Prof. Bakonyi, Prof. Schwarzacher), nanomodified materials for catalytic use (Prof. Theodoridou), deposition of nanowires and filling of nanopores (Prof. Mueller). The potentialities of the electrochemical methods of preparation of nanostructured materials (Dr. A. Zielonka), as well as of the methods of characterization of these materials (Dr. G. Nauer) have been outlined. Physical methods of creating nanostructures and nanostructured materials, such as laser interference metallurgy (Prof. F. Mücklich), were also discussed. Data concerning changes in numerous physical, electrical, magnetic, chemical and catalytic properties of the knowledge-based materials as a result of their nanoscaled structuring were reported. The presentations of the Bulgarian participants were focused on recent results on magnetic properties, periodic space-temporary structuring of alloy coatings, properties of special metal and oxide coatings for catalytic use, the interaction of hydrogen with metals during electrochemical processes, corrosion problems, etc.

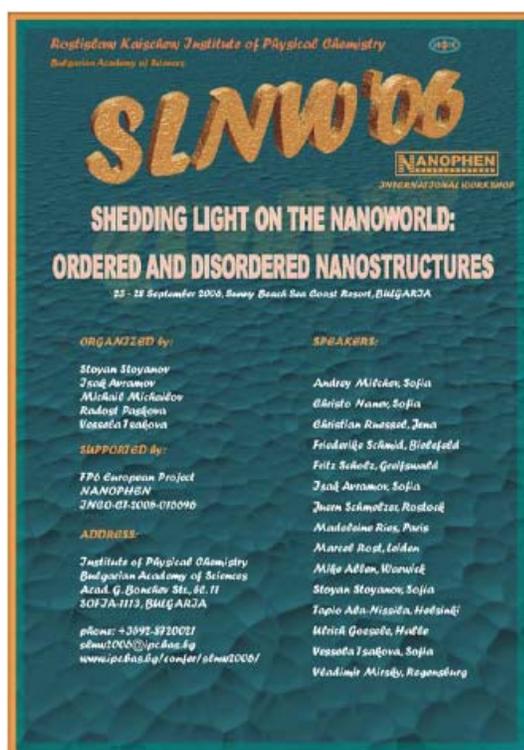


A **satellite round-table** discussion was also organized, with the participation of representatives from the Bulgarian electrochemical industry, coming from enterprises producing household appliances (ORBEL A.G. - Gotze Delchev), items for the military forces and NATO (SAMEI-90 A.G. - Samokov) and appliances for the electronic

industry (the Bulgarian branch of the EPIQ Group multinational trust - Botevgrad). The company representatives expressed keen interest in the properties of the new nanostructured materials and discussed some technical problems, related to their industrial production.

A book of abstracts and a Book comprising all the invited lectures and poster presentations in full text were issued. A detailed Expert report on the results and prospects of further development of the NANOPHEN in the area “Nanostructured materials in electroplating” was prepared (D 5, Table 1, Section 3).

The second NANOPHEN International Workshop “Shedding Light on the Nanoworld – ordered and disordered nanostructures” (SLNW’2006) was held from 23 to 28 of September, 2006 in Hotel Bellvue, at Sunny Beach, Bulgaria. The aim of this Workshop was to present the contemporary status in the field of ordered and disordered nanostructures, to identify the trends for future development in this field of research and to reveal new areas of possible collaborative work with European research institutions.



The detailed information for the meeting is to be found on the web-site: <http://www.ipc.bas.bg/confer/slnw2006/index.html>. The Workshop was attended by 45 participants, including 16 participants from seven European countries, namely Finland, Germany, Greece, Italy, The Netherlands, Russia, UK and also from Japan. The programme of the Workshop consisted of 15 invited lectures, 11 oral contributions and 21 posters presented in two posters session. Among the invited lecturers were prominent scientists from leading European research institution, e.g. Prof. Ulrich Goesele, Director of Max-Planck Institute for Microstructure Physics, Halle, Germany; Prof. Ari Ivaska, Director of the Research Institute of the Abo Academy University Foundation, Finland; Prof. Fritz Scholz, Director of the Institute of Chemistry and Biochemistry of the

University of Greifswald, Germany and Editor-in-chief of Journal of Solid State Electrochemistry.

The topics of the Workshop covered a wide scope of trends in the field of nanostructures, including formation of nanowires and nanopores in solid and soft matter, selforganization phenomena, computer modeling in nanoscale systems, atomic scale manipulation of surfaces, electrochemistry of nanostructured systems, polymer modified surfaces, glass forming systems and protein crystallization. Overview lectures, e.g. “Ordered nanopores and nanowires” (U. Goesele), “Nucleation in glass forming liquids (I. Gutzow), “Molecular simulation and theory of liquid crystals”(M. Allen) have shown the present state-of-the-art in the corresponding specific fields. Recent scientific achievements with important impact for future developments were demonstrated in the lectures “Seeing thin films evolve with real-time in-stu STM: Nanoscale observation of film growth and grain growth” (M. Rost), “Spreader bar approach for the formation of nanostructured self-assembled monolayers” (V. Mirsky), “Surface modified high rectification organic diode based on ordered nanostructures of sulphonated polyaniline” (A. Ivaska). The presentations of the Bulgarian participants were focused on recent results on carbon nanotubes formation, nucleation and growth of nanostructures, gold and copper nanoparticles formation, formation and electroactivity of nanocrystalline catalytic materials. A **special scientific session** was assigned to young Bulgarian scientists who presented their research results work before an international scientific audience for the first time.



The Workshop provided the opportunity of gathering experts from very different fields of science – surface physics, surface chemistry, polymer chemistry, electrochemistry, etc, all of them addressing various aspects of nanophenomena and nanostructures formation. The involvement of scientists belonging to not quite closely associated scientific communities resulted in impressively valuable scientific exchange of view points, ideas and approaches. Based on the delivered lectures, poster presentations and the large number of discussions, the following main topics for further development in collaboration with European research institutions have been identified:

1. Self-organization phenomena during growth/sublimation of crystalline surfaces are of special importance for various recent developments in the semiconductor technology and further miniaturization of electronic devices. This trend is based on theoretical and simulation studies started at IPC-BAS since the early 1990's. Interaction with scientists from France, Italy, Germany and Japan in this specific field has so far resulted in a number of joint publications. Further collaborations with both theoreticians and experimentalists from European research institutions was planned to support the further development of this topic.
2. Surface diffusion of two-dimensional clusters on ordered crystalline faces is one of the interesting topics in surface physics addressing the unique physical properties of nanostructures. The opportunity to compare computational results with experimental findings of cluster diffusion behaviour in a real physical system was discussed at the workshop and a STM experiment in the University of Leiden, The Netherlands was planned.
3. Nucleation and growth in glass forming systems is a traditional field of research of IPC-BAS. It is stepping now on the level of studies at nanoscale dimensions. Glass-ceramic materials with crystals of mean crystallite size in the nanorange are a great challenge to materials science, especially with regard to photonic applications. This trend is developing now with the participation of IPC-BAS in the frames a new FP6 project "Interface Controlled Nucleation and Crystallisation" (INTERCONY).
4. Investigations of polymer and co-polymer systems including nanostructure formation is a quickly developing research trend, having impact on various real systems. The research group in Sofia is specialized in Monte Carlo and Molecular Dynamic simulations of different nanostructures e.g. nanodroplets, tethered membranes, self-assembling complex liquids, etc. There is also a very successful collaboration with the group of Prof. Kurt Binder in Johannes Gutenberg University in Mainz, Germany.
5. Electrochemical formation of metal nanoparticles is a traditional field of research of IPC-BAS developed over the years, also within a number of European collaborations. New opportunities for visualization and surface analytical study of the nanoclusters were found for complementing the research in this field, and enhanced collaboration with German and Russian partners in particular, was envisaged.
6. Electrochemical synthesis and characterization of nanostructured metal/polymer materials for electrocatalytic applications is a trend, based on the quickly expanding activities of the group of studying conducting polymers at IPC-BAS. The group is involved in collaborations with German, Belgian and Greek partners. During the Workshop a new collaboration with Max-Planck Institute for Microstructure Physics, Halle, Germany was suggested allowing for further detailed surface analytical characterization of the synthesized composite materials.

In conclusion the Workshop "Shedding light in the nanoworld: ordered and disordered nanostructures" has achieved its basic goals – to identify the prospective trends for future development and to intensify the contacts of IPC-BAS researchers with similar European research institutions.

A book of abstracts was issued and distributed at the workshop (**D 10**, Table 1, Section 3).

The exploratory Workshop "**Nanoscale Phenomena in Colloid and Interface Science**" (**NPCIS'2007**) was the third in a series of scientific events devoted to the dissemination of knowledge in the third of the thematic priorities of NANOPHEN:

interfacial phenomena in colloid systems. This Workshop was performed in September 20-22, 2007 in Plovdiv and aimed at presenting the contemporary state in the field of colloid and interface science, identifying the prospective trends for future development in this field of research, and outlining new areas for collaborative work with scientific laboratories in European research institutions. An announcement have also been publish in the quarterly of the International Association of Colloid and Interfaces Scientists (IACIS). Full information for the meeting was to be found on the IPC-BAS web-site: <http://www.ipc.bas.bg/confer/NPCIS2007/index.html>.

NANOPHEN NPCIS'2007 workshop is supported by FP6 European contract "NANOPHEN" (INCO-CT-2005-016696)

International Workshop Sept. 20-22, 2007, Plovdiv, BULGARIA

Nanoscale Phenomena in Colloid and Interface Science

ORGANIZED BY INSTITUTE OF PHYSICAL CHEMISTRY • BULGARIAN ACADEMY OF SCIENCES
<http://www.ipc.bas.bg/confer/NPCIS2007/index.html>

WORKSHOP FOCUS

The workshop will focus on some fundamental aspects of Nanoscale Phenomena in Colloid and Interface Science. It aims to present advanced research and give floor to extensive discussion on the topics. Also, some innovative application opportunities of colloidal dispersions, foams and emulsions will be explored.

TOPICS

- ◆ Thin Liquid Films
- ◆ Colloidal Dispersions, Foams, Emulsions
- ◆ Electro-optics of Colloid Particles and Multilayers
- ◆ Self-Assembly in Amphiphilic Systems

INVITED LECTURERS

Angel Delgado, Spain	Monika Schoenhoff, Germany
Brian Vincent, UK	Polycarpos Pispis, Greece
Cosima Stubenrauch, Ireland	Pyotr Kruglyakov, Russia
Felix Sarmiento, Spain	Reinhard Miller, Germany
Francesco Mantegazza, Italy	Rossen Sedev, Australia
Johannes Lyklema, The Netherlands	Tharwat Tadros, UK
Kazimierz Malysa, Poland	Victor Bunin, Germany
Libero Liggieri, Italy	Victor Starov, UK
Matthias Ballauff, Germany	

The scientific programme will include invited lectures (30 min with discussion), oral contributions (20 min with discussion) and posters (W/H: 90 cm/100 cm).

ORGANIZING COMMITTEE

Co-chairmen:	Members:	Contact address:	
Datchi Exerowa	Dimo Platikanov	NPCIS 2007 workshop	Email: npcis@ipc.bas.bg
Stoyl Stoylov	Ivana Petkanchin	Institute of Physical Chemistry,	Tel: (+359 2) 871 9206
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IPC **NANO PHEN**

A total of 76 scientists attended the workshop, including 33 participants from 11 European countries, namely Germany, Ireland, Italy, Poland, UK, Greece, the Netherlands, Spain, Turkey, Russia, Ukraine and also from Israel, Australia and Canada. Among the Bulgarian participants 22 were from IPC-BAS and 21 from other research institutes and three universities. The Workshop program consisted of 18 invited lectures and 22 oral contributions. In the poster session, 25 posters were presented and discussed. Due to financial support of "NANOPHEN" the participating young scientist and PhD students were about 50% of the total number of the participants.



The topics of the Workshop covered a wide scope of trends in nanoscale phenomena in thin liquid films; colloidal dispersions, foams and emulsions; electro-optics of colloid particles and multilayers, as well as self-assembly in amphiphilic systems. The invited lecturers, selected by the Organizing Committee, were prominent scientists from leading research institutions in the field of interface and colloid science. Among them were Prof. J. Lyklema, University of Wageningen, the Netherlands, author of *Fundamentals of Interface and Colloid Science*, a five volume series; Prof. Th. Tadros, UK, Honorary Editor of both *Advances in Colloid and Interface Science* and *Colloids and Surfaces A*; Prof. R. Miller, Head of Nanocolloid Chemistry Group at the Max-Planck-Institute of Colloids and Interfaces, Germany; Prof. M. Ballauff, Head of Physical Chemistry I Dept., University of Bayreuth, Germany; Prof. P. Pissis, Head of Physics Dept., National Technical University of Athens, Greece, etc. Among the feature lectures were: “Overcharging: Observations and Interpretations” (J. Lyklema), “Use of Polymeric Surfactants for Stabilization of Nano-dispersions” (Th. Tadros), “Disjoining Pressure of Thin Foam Films: Single Surfactants Compared to Surfactant Mixtures” (C. Stubenrauch), “Wetting Behaviour and Wetting Transitions of Hydrocarbon Liquids on Aqueous Surfaces” (L. Boinovich), “Microgel Particles: Fundamentals and Applications” (B. Vincent), “Fluorinated Materials as Colloidal Systems” (F. Sarmiento), “Dilational Rheology of Interfacial Layers: Models, Methods and Results” (L. Liggieri), “Nanobubbles and the Three-phase-contact Formation at Hydrophobic Surfaces” (K. Malysa), “Dielectric Relaxation in Concentrated Colloidal Systems: Theory and Experiments” (A. Delgado), “NMR Studies of Exchange and Dynamics of Probe Molecules in Colloidal Dispersions” (M. Schönhoff). Important input was given by young scientists and PhD students who delivered a large part of the oral contributions. They presented their results with competency, profoundness and enthusiasm. The poster session gave them an opportunity to benefit from the direct contact with prominent scientists in the various areas.

The oral and poster presentations of the Bulgarian scientists were focused on the recent achievements in IPC-BAS, namely studying of surface forces at fluid interfaces by the unique microinterferometric foam-film instrumentation, foam stability studies with an original automated foam-stability instrumentation, specific studies of amphiphilic bilayers as in vitro model of biological membranes, development of electro-optic methods for characterization of colloid particles, study of electric polarization and polarity phenomena of nanostructures. Thin liquid films were given special emphasis as being the basic model for the study of colloid stability. Nanostructures and phenomena in biocolloids represented a significant portion in the contributions. Model studies at

interfaces were also presented, such as model of alveolar surface and stability, drug delivery systems, interactions of DNA with lipids and etc.

The International Workshop in Plovdiv outlined the most important trends in the area of nanophenomena in colloids and surfaces science, namely: (i) structure and interaction in adsorption layers at various interfaces (R. Miller, L. Liggeri); (ii) formation and stability of thin liquid films from natural and industrially important surfactants (Th. Tadros, C. Stubenrauch); (iii) microgel particles and particles in nanometer scale range - fundamentals and applications (B. Vincent, M. Ballauff, S. Peker); (iv) colloid disperse systems and their applications (M. Schönhoff, K. Malysa, P. Kruglyakov); (v) dielectric phenomena in nano-disperse systems (A. Delgado, P. Pissis).

The achievements and benefits of the **Nanoscale Phenomena in Colloid and Interface Science International Workshop** are as follows:

A. A major achievement and benefit of the Workshop is the active involvement of the young scientists of IPC-BAS, the opportunity to meet in person and discuss science with prominent researchers and establish new contacts among participants. The participation of prominent scientists in the area of colloids and interface science on the one hand, and the attendance of a large group of young scientist and PhD students from Bulgaria and other European countries on the other hand, provided for setting up of a collaborative and focused workshop environment.

B. Intense discussions throughout the Workshop allowed for outlining the main issues and topics in the area of colloids and interfaces such as application thin liquid films as a model and instrumentation in the study of surface forces, nanostructures and phenomena in biocolloids, drug delivery systems, electro-optics of colloids, formation of multilayers on nanoparticles, self-assembly in amphiphilic solutions, surfactant adsorption layers: kinetics and surface rheology.

C. Based on the high level of the Bulgarian school in colloid chemistry, particularly in the area of physical chemistry of thin liquid films and electro-optics of colloids, several opportunities for new research contacts and joint participation in European framework programs have been outlined:

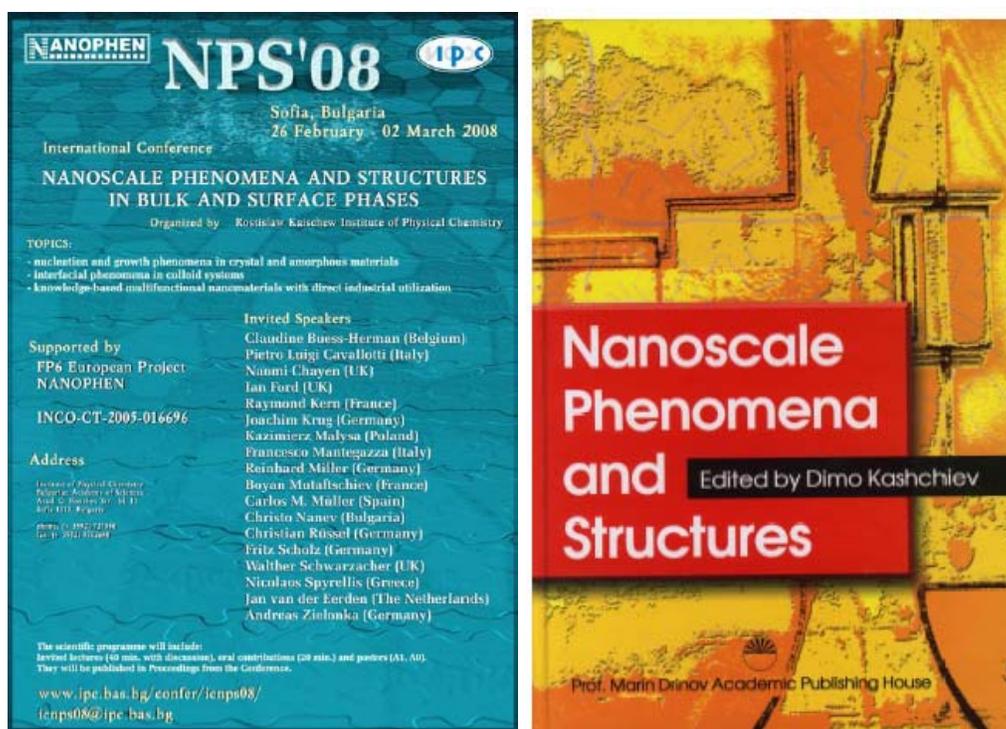
1. Surface forces and interactions determining the stability of colloid suspensions, foams and emulsions in view of application in biotechnology and medicine (IPC-BAS (Sofia), Max-Planck-Institut für Kolloid- und Grenzflächenforschung (Golm), University of Bristol (Bristol), University of Loughborough (Loughborough), University College Dublin (Ireland));
2. Interrelation of adsorption layer properties and thin liquid film kinetics in surfactant solutions containing amphiphilic nanostructures (IPC-BAS (Sofia), Max-Planck-Institut für Kolloid- und Grenzflächenforschung (Golm), CNR - Istituto per l'Energetica e le Interfasi (Genova));
3. Self-assembly in complex fluids containing partially fluorinated surfactants (IPC-BAS (Sofia), University of Santiago de Compostela (Santiago de Compostela));
4. Formation of polyelectrolyte multilayers on colloid particles and planar substrates and their electrical characteristics in the presence of residual small ions in view of practical applications in electronics (IPC-BAS (Sofia), Westfälische-Wilhelms Universität (Münster)).

In conclusion “**Nanoscale Phenomena in Colloid and Interface Science**” **International Workshop** has achieved its basic goals – to demonstrate the strong and

well developed specific research in this thematic priority of NANOPHEN, to identify the prospective trends for future development in the field and to intensify the contacts of IPC-BAS researchers with similar European research institutions.

A **Book of Abstracts** was issued and distributed at the Workshop (**D 12**, Table 1, Section 3).

From 26 February to 2 March 2008 the Institute of Physical Chemistry at the Bulgarian Academy of Sciences (IPC-BAS) hosted in Sofia the NANOPHEN International Conference “**Nanoscale Phenomena and Structures in Bulk and Surface Phases**” (NPS’08). The Conference was the last in the series of scientific events devoted to the dissemination of knowledge in the thematic priorities of the NANOPHEN Project, namely: Topic 1 – nucleation and growth phenomena in crystal and amorphous materials, Topic 2 – interfacial phenomena in colloid systems, and Topic 3 – knowledge-based multifunctional nanomaterials with direct industrial utilization.



The Conference Organizing Committee was chaired by Prof. Christo Nanev, former Director of IPC-BAS, and included eight scientists from the institute. The Conference International Advisory Board was comprised of the five members of NANOPHEN Project International Expert Group: Prof. Kurt Binder, Prof. Claudine Buess-Hermann, Prof. Joachim Krug, Prof. Reinhard Miller and Dr. Andreas Zielonka.

The NPS’08 basic objective was to enhance the collaboration among similar research institutions in the European Union and to initiate European scientific networks in the thematic priorities of the NANOPHEN project. The Conference program, presented in the **NPS’08 Book of Abstracts**, includes 17 invited lectures as well as 21 oral and 53 poster presentations most of which are included in the **Conference**

Proceedings (D 15, Table 1, Section 3). Both the Book of Abstracts and the Proceedings of the Conference have been distributed among all the participants.



NPS'08 was attended by 107 scientists, 19 of them from 9 EU member-countries, namely Germany, Italy, France, Spain, The Netherlands, Poland, Greece, Belgium and UK, and 3 from countries (Russia and Serbia) outside EU. Among the Bulgarian participants, 73 were from IPC-BAS and 12 from other Bulgarian scientific institutions. As invited lecturers the Organizing Committee selected four of the members of the NANOPHEN International Expert Group, as well as several other internationally known experts in the three of the NPS'08 topics listed above. Particularly notable names of invited lecturers are: Raymond Kern, Boyan Mutaftschiev, Jan van der Eerden, Kazimierz Malysa, Francesco Mantegazza, Pietro-Luidgi Cavallotti, Walther Schwarzacher, Nikolaos Spyrellis, Carlos M. Müller. The oral and poster presentations were made mostly by Bulgarian scientists, both from IPC-BAS, from other BAS institutes and from Sofia University.

The Conference topics covered a wide range of issues in nanoscale phenomena and structures. In Topic 1 results of studies were presented on: stochastic and kinetic aspects of the nanoparticle nucleation theory and experiment (I. J. Ford, D. Kashchiev, I. Markov, A. Milchev, A. I. Danilov), classical issues and modern developments in crystal growth, nanostructures on crystal surfaces and protein crystallization (B. Mutaftschiev, R. Kern, J. Krug, S. Stoyanov, M. Michailov, Chr. Naney), interface-controlled crystallization and diffusion of foreign particles in glass-forming melts (C. Rüssel, I. Avramov), electrochemistry of self-assembled monolayers, liposomes and deposition of one-dimensional nanostructures on templates and of metal nanoparticles

on conducting polymer layers (C. Buess-Herman, V. A. Hernandez, C. M. Müller, V. Tsakova). In Topic 2 theoretical and experimental results were reported on: impact of surface dynamics and forces on thin liquid film formation and stability (R. Miller, K. Malysa, D. Exerowa), wetting contact angles of thin liquid films and stretching elasticity of membrane bilayers (L. Alexandrova, I. Bivas), measurement of molecular interaction forces in foam films (D. Exerowa), formation, stability and morphology of nanosized phospholipid monolayers (Z. Lalchev), self-assembled nanostructures and adsorption layers in solutions and thin liquid films or at interfaces (E. Mileva), orientation and clustering of colloidal particles in external electric field and electro-optics of charged colloids and colloid-polyelectrolyte complexes (F. Mantegazza, M. Stoimenova, Ts. Radeva). In Topic 3 results of studies were presented on: magnetoferritin – a model nanomagnetic system (W. Schwarzacher), nanostructured metal/alloy matrix composite electrocoatings and autocatalytic deposition of binary, ternary and quaternary alloys (N. Spyrellis, P.-L. Cavalotti, S. Armyanov), incorporation of gold nanoparticles in electrodeposited layers and their formation in glass (A. Zielonka, D. Tatchev), microscale- and nanoscale-architected thin solid films and light-stimulated nanocomposite synthesis (N. Starbov, K. Starbova), electrodeposited alloy coatings and powders and self-organized periodic structures in alloy electrodeposition (M. Monev, B. M. Jovic, I. Krastev), materials for hydrogen permeation, storage and evolution (L. Mirkova, T. Spassov, A. Zielonka), corrosion protection of electrodeposited films (D. Stoychev, Ts. Dobrev), analysis of ecologically harmful heavy-metal particles in industrial atmospheric dusts (V. Stoyanova).

Within the framework of the Conference, a half-day **Symposium** also took place on the occasion of the 100th Anniversary of the birth of Prof. Rostislav Kaischew, founder of the Bulgarian school in physical chemistry, and of the 50th Anniversary of IPC-BAS founded and first directed by him.

The main result of the Conference was that it made possible to gather scientists who could exchange information and borrow ideas from three complementary fields of nanoscience and nanotechnology. NPS'08 showed the contemporary level of knowledge and the research trends in these fields. Other benefits are also the following:

1. NPS'08 has shown that research in the traditional scientific fields of IPC-BAS is very active and has the capacity and resources for significant achievements.
2. NPS'08 was a significant step towards the further IPC-BAS integration in the European Research Community in the fields of phase formation and growth, colloid and interface science, and electrochemical processes and coatings related to nanostructured materials.
3. NPS'08 was a good chance for the young researchers of IPC-BAS and other Bulgarian research organizations to meet outstanding European scientists, to present and discuss their own results. They were thus able to acquire broader knowledge in the respective research field.
4. The Rostislav Kaischew Symposium made it possible to portray the origin and some of the most important achievements of the Bulgarian school in physical chemistry. This inspires the Bulgarian researchers, especially the younger of them, to keep up the established high standards of the school and to strive towards further even more significant scientific results.
5. Throughout NPS'08, future joint collaborative projects and networking activities were discussed and outlined.

Thus, the final NANOPHEN International Conference “**Nanoscale Phenomena and Structures in Bulk and Surface Phases**” has achieved its basic goal to enhance the collaboration with similar research institutions in the European Union and to initiate new scientific collaborative links in the thematic priorities of the NANOPHEN Project.

A **Book of Abstracts, NPS’08 Proceedings: “Nanoscale Phenomena and Structures”**, Edited by D. Kashchiev, Prof. M. Drinov Academic Publishing House, Sofia, 2008 and a **Compact Disk** with all contributions to NPS’08 were issued (**D 15**, Table 1, Section 3).

T 4-2: Participation of IPC-BAS scientists in international scientific events

The three years of NANOPHEN implementation was also marked by an intensive **participation of IPC-BAS scientists in international scientific events**. More than **40** scientists from the Institute have delivered more than **50** presentations on various scientific events, performed in EU countries.:

1. Stefan Armyanov
Congress EUROMAT 2005, 5th - 8th September, Prague, Czech Republic
Oral presentation: “*Autocatalytic (electroless) ternary alloys. Amorphous and crystalline coatings, composition structure and properties*”
Authors: S.Armyanov and E.Valova
2. Evgeniya Hristova
17th European Chemistry and Interfaces Conference, 27th June – 1st July, 2005
Loughborough, UK.
Oral presentation: “*Foam film characterization of commercial surfactants and their mixtures*”
Authors: E.Hristova, Khr.Khristov and D.Exerowa.
3. Jacqueline Yaneva
6th Liquid Matter Conference, 2nd - 6th July, 2005, Utrecht, The Netherlands
Poster presentation: “*Static and dynamic properties of nano-droplets on chemically structured substrates: a MD simulation*”
Authors: J.Yaneva, A.Milchev and K.Binder.
4. Andrey Milchev
International School of Solid State Physics - 34th course: Computer simulations in condensed matters - from materials to chemical biology, 20th July-1st August, 2005, Erice-Sicily, Italy
Invited lecture: “*Simulation of nanodroplets on solid surfaces: wetting, spreading, bridging and flow*”
Author: A.Milchev
5. Christo Naney
Interdisciplinary transport phenomena in micro-gravity and space science IV, 7th-12th August, 2005, Tomar, Portugal
Invited lecture: “*Is the crystal growth under low supersaturations influenced by the tendency to a minimum of the surface free energy?*”
Author: Chr. Naney
Oral presentation: “*Hypergravity as a crystallization tool*”
Authors: Chr. Naney and I.Dimitrov
6. Anita Penkova

- Interdisciplinary transport phenomena in micro-gravity and space science IV, 7th-12th August, 2005, Tomar, Portugal
Oral presentation: *“Enhancement and suppression of protein crystal nucleation under influence of shear flow”*
Authors: A.Penkova, W.Pan and P.Vekilov
7. Dragomir Tatchev
3rd Balkan Conference on glass science and technology, 26th - 30th September, 2005, Varna, Bulgaria
Oral presentation: *“Simultaneous determination of the size and composition of nano-precipitates in amorphous Ni-P alloys”*
Authors: D.Tatchev, R.Kranold, A.Hoell, G.Goerigk, E.Valova, J.Dille and S. Armyanov.
8. Tsvetan Vassilev
3rd Balkan Conference on glass science and technology, 26th – 30th September, 2005, Varna, Bulgaria
Poster presentation: *“The glass transition of multicomponent Pb rich glass enamels: a TMDSC study”*
Authors: Ts.Vassilev, Chr. Tzvetkova, I.Penkov and I.Avramov
9. Isak Avramov
3rd Balkan Conference on glass science and technology, 26th – 30th September, Varna, 2005, Bulgaria
Plenary lecture: *“Temperature and pressure dependence of viscosity of glassforming melts”*
Poster presentations:
1. *“The glass transition of multicomponent Pb rich glass enamels: a TMDSC study”*
Authors: Ts.Vassilev, Chr. Tzvetkova, I.Penkov and I.Avramov
2. *“New methods to analyse data on overall crystallization kinetics”*
Authors: I. Avramov, K.Avramova and C.Russel.
10. Plamen Tchoukov
Fluid foam physics: a model for complex systems, 9th-20th January, 2006, Les Houches, France
Oral presentation: *“Study of foam film drainage via microinterferometric techniques”*
Authors: P.Tchoukov, E.Mileva and D.Exerowa
11. Valeria Stoyanova
Conference on Modern Management of Mine Producing – Environmental Protection, 12- 16 June , 2006, Albena , Bulgaria
Oral presentation: *“Trace elements in fly ashes from “Varna” , Bobov dol”, “Maritza Iztok I”, “Maritza Iztok III”, “Republika” and “Rousse Iztok” power plants, Bulgaria”*
12. Elena Mileva
6th European Conference on Foams, Emulsions and Applications
July 2 – 6 , 2006, Potsdam, Germany
Oral presentation: *“Impact of self-assembled surfactant structures on the drainage hydrodynamics of foam films”*
Poster presentation: *“Adsorption dynamics and foaming behaviour of aqueous solutions”*

13. Vessela Tsakova
6th International Symposium on Electrochemical Micro & Nanosystem Technology,
August 22 – 25, 2006, Bonn, Germany
Oral presentation: “*Metal particles modification of conducting polymers for electro-catalytic reactions involving bioactive compounds*”
14. Ivan Tomov
XX Conference on Applied Crystallography, September 11-14, 2006, Wisla, Poland
Poster presentation: “*Thickness measurement of thin textured films by a novel X-ray diffraction method accounting for secondary extinction*”
15. Hristina Popova
Third Humboldt Conference on Computational Chemistry,
June 24 – 28, 2006, Varna, Bulgaria
Poster presentation: “*Structural and dynamic properties of tethered membranes: Monte Carlo simulation study*”
16. Svetoslav Ivanov
Third Humboldt Conference on Computational Chemistry,
June 24 – 28, 2006, Varna, Bulgaria
Poster presentation: “*Dynamic behavior of self-assembling complex liquids*”
17. Nikolai Boshkov
57th Annual Meeting of the International Society of Electrochemistry
August 27 September 1, Edinburgh, UK
Oral presentation: “*Corrosion studies of nanostructured composite coatings based on Zinc and Zinc-Cobalt alloys*”
18. Michail Michailov
24th European Conference on Surface Science, September 4 – 8, Paris, France
Poster presentation: “*Surface diffusion of Pb clusters on Cu (111) influenced by size dependent cluster-substrate misfit: Monte Carlo tight binding simulation model*”
19. Anna Gurova
11th Conference of the microbiologists in Bulgaria, October 5 –7, 2006, Varna, Bulgaria
Poster presentation “*Electro-optical method as a new approach of investigation and discrimination of two strains Escherichia coli*”
20. Ivan Gutzov
XIth International Conference on the Physics of non Crystalline Solids,
October 29 – November 2, 2006, Rhodes, Greece
Invited lecture: “*The generic phenomenological theory of glass transition: a new approach, new solutions and perspectives*”
21. Kamelia Kamburova
9th Workshop “Nanoscience and Nanotechnology”, 28.11.2007 – 30.11.2007, Sofia, Bulgaria.
Poster presentation: “*Multilayers from biopolymers on colloidal particles*”
22. Viktoria Milkova
9th Workshop “Nanoscience and Nanotechnology”, 28.11.2007 – 30.11.2007, Sofia, Bulgaria.
Poster presentation: “*Effect of charge density on the construction of polyelectrolyte multilayers on colloidal particles*”

23. Ivaylo Dimitrov
8th International Workshop on Applied Physics, July 5-7, 2007, Constanta, Romania.
Poster presentation: “*Crystallization of proteins from solutions containing macromolecular impurities*”
24. Ivan Krastev
Lecturer in a School for young researchers „Micro and Nanoscale Patterned Deposition”, 14-17 October 2007 in Athens
Title of the lecture: “*Nanostructured Coatings (Multilayer)*”.
International conference „EUROINTERFINISH 2007“ , 18-19 October 2007 in Athens, Greece
Oral presentation: “*Properties of silver-indium alloys electrodeposited from cyanide electrolytes*”.
25. Stephan Armyanov
European Congress on Advanced Materials and Processes, 10-13 September 2007, Nuremberg, Germany
Oral presentation: “*Corrosion Behavior and Physical Properties of Electroless Ternary Alloys*”
Authors: J. Georgieva, E. Valova, S. Armyanov.
26. Feyzim Hodzhaoglu
8th International Balkan Workshop on Applied Physics, July, 5-7, 2007, Ovidius University, Constanta, Romania,
Poster presentation: “*HEWL Crystal Nucleation in Thin Solution Layers*”
Authors: F. Hodzhaoglu, L. Stanoeva, C. Nanev
27. Vessela Tsakova
European Materials Research Society Meeting, May 28 - June 1, 2007, Strasbourg, France; Symposium “Functional organic & inorganic materials for micro and nano bio-sensing systems”
Oral presentation: “*Voltammetric and conductometric detection of ascorbic acid at polyaniline and poly-o-methoxyaniline modified electrodes*”
28. Elena Mileva
17th International Symposium on Surfactants in Solution, 17-22 August, 2008, Berlin, Germany,
Oral presentation: “*Foam film drainage kinetics and rheology of adsorption layers for surfactant solutions of premicellar concentration*”
Poster presentation: “*Study of adsorption dynamics and foam film kinetics for ionic surfactant hexadecyltrimethylammonium chloride*”
Authors: P. Tchoukov, E. Mileva, D. Arabadzhieva, R. Miller
Poster presentation: “*Investigations on foam-film drainage kinetics and adsorption layer properties of aqueous solutions of C12E4 and C12E5*”
Authors: D. Arabadzhieva, P. Tchoukov, E. Mileva, R. Miller, E. Santini, F. Ravera, L. Liggieri
Poster presentation: “*Boundary layers on rising bubbles entrapping fine solids*”
Authors: E. Mileva, L. Nikolov
29. Vessela Tsakova
59th Annual Meeting of the International Society of Electrochemistry, September 2008, Sevilla, Spain,

Oral presentation: “*Characteristics of Polyaniline Layers Electrochemically Synthesized in the Presence of a Sulfonic and the Corresponding Poly-sulfonic Acid*”
Authors: V. Lyutov, S. Ivanov, V. M. Mirsky, V. Tsakova

30. Svetlozar Ivanov
59th Annual Meeting of the International Society of Electrochemistry, September 2008, Sevilla, Spain,
Poster presentation: “*Photoelectroactivity of High Temperature-Treated TiO₂-Polyaniline Nanocomposite Layers*”
Authors: S. Ivanov, V. Lyutov, V. Tsakova
31. Ivan Krastev
59th Annual Meeting of the International Society of Electrochemistry, September 2008, Sevilla, Spain,
Oral presentation: “*Electrodeposition of self-structured silver alloy coatings*”

A group of young researches of IPC-BAS, incl. all the newly hired young scientists, are going to participate in the Sixth International Conference of the Chemical Societies of the Eastern European Countries (ICOSECS-6), 10-14 September, 2008, Sofia, Bulgaria:
32. Svetla Nineva
Presentation: “*Study of electrodeposited silver-cobalt alloy*”
Authors: S. Nineva, Ts. Dobrovolska, I. Krastev
33. Hristina Petkova
Presentation: “*Electric surface properties of foam films stabilized by polyoxyalkyllate based polymeric surfactant*”
Authors: H. Petkova, Khr. Khristov, D. Exerowa, J. Beetge, J. Venter
34. Victoria Milkova
Presentation: “*Complexation of ferric oxide particles with pectins of different charge density*”
Authors: V. Milkova, K. Kamburova, I. Petkanchin, Ts. Radeva
35. Svetlozar Ivanov
Presentation: “*Electrochemical characterization of PANI-PSS LbL self assembled conducting polymer coatings*”
Authors: S. Ivanov, V. Mirsky, V. Tsakova
36. Ljubomir Nikolov
Presentation: “*Particle entrapment in the hydrodynamic boundary layers*”
Authors: L. Nikolov, E. Mileva
37. Rossen Christov
Presentation: “*Investigation of carboxymethylcellulose adsorption on aluminium oxide nanoparticles*”
Authors: R. Christov, A. Zhivkov
38. Alexander Zhivkov
Presentation: “*Application of Brooks’ and Donath’s theories to non-Smoluchowski electrophoretic mobility of liposomes in aqueous solution of poly(ethylene glycol)*”
Authors: A. Zhivkov, Yu. Ermakov
39. Dimitrinka Arabadzhieva

Presentation: “*Adsorption layers stabilized with non-ionic surfactants-dynamic and equilibrium adsorption data and foal film properties*”

Authors: D. Arabadzhieva, R. Miller, L. Ligierri, E. Mileva

40. Nelly Tsvetkova

Presentation: “*Corrosion Characterization of conversion coatings on Zn and Zn-Co obtained from environmental friendly solutions without Cr⁺ ions*”

Authors: N. Tsvetkova, S. Vitkova, M. Peshova, L. Lutov, G. Raichevski, N. Boshkov

41. Anna Gyurova

Presentation: “*High frequency electric polarizabilty of bacteria E. coli: Dependence on the medium ionic strength*”

Authors: A. Gyurova, A. Zhivkov

42. Kamelia Kamburova

Presentation: “*Effect of pectin charge density on formation of multilayer films with chitozan*”

Authors: K. Kamburova, V. Milkova, I. Petkanchin, Ts. Radeva

43. Anelia Stoyanova

Presentation: “*Copper-modified poly-3,4,-ethylenedioxythiophene layers for selective electrochemical determination of dopamine*”

Authors: A. Stoyanova, V. Tsakova

44. Vladimir Lyutov

Presentation: “*Electrochemical investigation of polyaniline doped with 2-acrylamido-2-methyl-1-propanesulfonoc acid or the corresponding polymer acid: pH dependence of conductivity and electroactivity*”

Authors: V. Lyutov, S. Ivanov, V. Mirsky, V. Tsakova

45. Tsvetina Dobrovoska

Presentation: “*Self-organization phenomena during electrodeposition of some silver alloys*”

Authors: Ts. Dobrovolska. I. Krastev

In conclusion, it is essential to point out that Task 4.2 of Project NANOPHEN enhanced significantly the visibility of IPC-BAS researchers’ scientific activities. The most important outcome was that the EC funding has allowed the young and newly hired researchers in our Institute to participate in most important scientific events in their respective research areas.

T 4-3: Access to recent books and specialized book series

During the first year of NANOPHEN, some funds have also been allocated to support financially the purchase of new books and book series in the thematic priorities of the NANOPHEN. The following books have been purchased:

1. E. Kaxiras, Atomic and Electronic structure of solids, Cambridge University Press 2003.
2. G. I. Barenblatt, Scaling, self-similarity and intermediate asymptotics: dimensional analysis and intermediate asymptotics (Cambridge Texts in Applied Mathematics), (paperback), Cambridge University Press 1996.

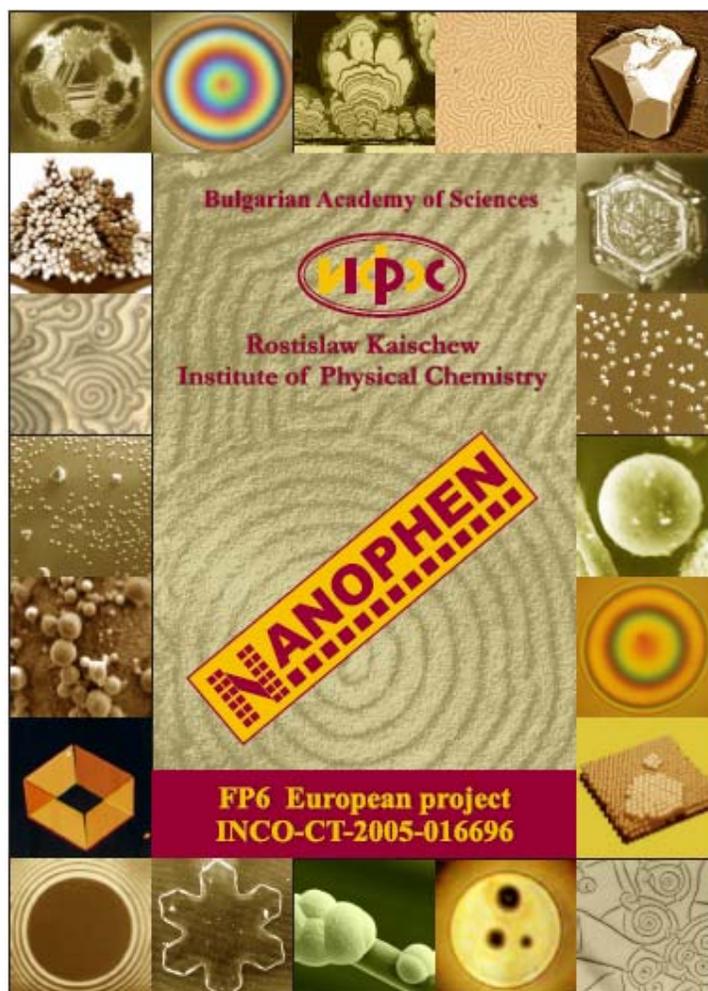
3. D. P. Landau and K. Binder, A guide of Monte Carlo Simulations in Statistical Physics, Cambridge University Press 2000.
4. Carel J. van Oss, Interfacial Forces in Aqueous Media, CRC Press, 2006.
5. V. Starov, M. Velarde, C. Radke, Wetting and Spreading Dynamics, CRC Press, 2007.
6. H. Vehkamäki, Classical Nucleation Theory in Multicomponent - Systems, Springer, Berlin, 2006.
7. Richard A.L. Jones, Soft Condensed Matter, Oxford University Press, 2002,
8. Patric Tabeling, Introduction to Microfluidics, , Oxford University Press, 2005.
9. M.-C. Desjonqueres and D. Spaniaard, Concepts in Surface Physics, (Springer Series in Surface Science), Springer, 2nd edition, 2002,
10. Handbook of conducting polymers, ed. by T. Skotheim, R. Elsenbaumer, and J. Reynolds, Marcel Dekker, Third Edition, CRC Press, 2007.
11. Interfacial electrokinetics and electrophoresis (Surfactant Science Series), ed. by A. V. Delgado, Marcel Dekker, 2001.
12. F. Scholz, Electroanalytical methods, Springer Verlag Berlin-Heidelberg, 2005.
13. J. Koetz, S. Cosmella, Polyelectrolytes and nanoparticles, Springer Laboratory Manuals in Polymer Science, Springer Verlag Berlin-Heidelberg, 2007.
14. C.H. Hamann, A. Hamnett, W. Vielstich, Electrochemistry, 2nd completely revised and updated edition, Wiley Interscience.
15. V.S. Bagotsky, Fundamentals of Electrochemistry, 2nd edition, Wiley Interscience
16. G. Wallace, G. M. Spinks, L. A.P.Kane-Maguire, P. R. Teasdale, Conductive Electroactive Polymers, 2nd edition, Taylor and Francis, 2003.
17. J. Unruh, Tabellenbuch Galvanotechnik, Eugen G. Leuze Verlag, Germany.
18. D. C. Rapaport, The Art of Molecular Dynamics Simulations, Cambridge University Press 1997.
19. LINUX – a guide for the system administrator, Sofia, 2005.
20. V. V. Krotov and A. I. Rusanov, Physicochemical hydrodynamics of capillary systems, World Scientific Publishing Co. 1999.
21. J. W. Jelinek, Galvanische Verzinkung, Band 32, Elektrolyte, Nachbehandlung, Anwendung, Eugen G. Leuze Verlag, Germany.

T 4-4: Intensifying the relations with public and societal issues

The set of activities aimed at intensifying the relations with public have been envisaged. Thus implementation of the project NANOPHEN has also added to the **citizen awareness** for the importance of expected future development in NMP. NANOPHEN participated actively in actions of this type, namely (see also **D 16**, Table 1, Section 3):

1. The **exhibition** “Machines, technologies, materials”-Days of the Bulgarian industry; March 24–28, 2006 in Inter-Expo Center, Sofia. This exhibition was attended by high officials from the Bulgarian government, as well.

2. The **exhibition** “Bulgarian Academy of Sciences in the European Research Area” April 7–10, 2006. This was an initiative of BAS, devoted to the forthcoming membership of Bulgaria in EU. The exhibition was attended by the Bulgarian Minister of Education and Science. The coordinator of NANOPHEN Elena Mileva has also participated in the Meeting with the European Commissioner for Science and Research **Jannek Potochnik** in Sofia on the April, 11, 2006.
3. In the beginning of the reporting period a **project-related website** was elaborated **<http://ipchp.ipc.bas.bg/Nanophen>**. This website serves as a virtual medium for promotion of the project-related activities, upload of application forms, advertising and reporting project events and actions
4. A **special brochure** was issued, devoted to the project NANOPHEN and the expertise offered by the scientific departments in IPC-BAS. It has been distributed on the exhibitions (the events described in points 1&2) and among the collaborative partners of our institute throughout of the various meetings and scientific events of the project (see Appendix 2)



5. During the first year of the NANOPHEN project two major events have been organized. The first initiative was “**National Day of Nanotechnology**” in June 2005 and was devoted to the promotion of the scientific activities of various research

groups and institution in Bulgaria in the field of Nanosciences and Nanotechnologies. One of the basic lectures on this forum was delivered by Vessela Tsakova, Deputy Coordinator of NANOPHEN and the title was “**NANOPHEN: IPC-BAS in the European Research Area**”. The lecture may be found on the NANOPHEN web-site.

6. In the midterm of the project implementation time period we have organized a **presentation of the NANOPHEN project**. This presentation was attended by two deputy ministers from the Ministry of Education and Science, as well as by several high officials from the administration of the Bulgarian Academy of Sciences. The presentation was also attended by all Directors of the Institutes of the Bulgarian Academy of Sciences whose research activity is in the field of Natural Sciences. The coordinator of NANOPHEN Elena Mileva explained the structure of the project and how it worked during the first one and a half year. The scientific equipment purchased with the financial assistance of NANOPHEN has been shown to the guests. The conditions for eventual collaborative research activities and advanced training of young researchers have been discussed. An announcement about this event was published in the **Official Bulletin of the Bulgarian Academy of Sciences**.



Институт по физикохимия „Акад. Р. Каишев“

На 16 ноември 2006 г. в Института по физикохимия „Акад. Р. Каишев“ се състоя официалното представяне на новата апаратура, закупена със средства по проект от VI Рамкова програма на ЕК за финансиране на Центрове за висококачествени изследвания “Nanoscale Phenomena and Structures in Bulk and Surface Phases” (NANOPHEN), INCO-CT-2005-016696, с координатор ст.н.с. Е. Милева.



Присъстваха зам.-министрите на образованието и науката, г-жа Ваня Добрева и г-н Кирил Атанасов, както и членове на ръководството на БАН – зам.-председателят, акад. К. Косев, и научният секретар, чл.-кор. Ал. Попов, представители на Химическия факултет на СУ „Св. Кл. Охридски“, официално поканени директори и учени от сродни институти. Доманин на срещата беше директорът на Института по физикохимия, ст.н.с. I ст. д-р Христо Нанев.

Зам.-министрите на образованието и науката поздравиха учените от Института за спечелването на един от 7 проекта за България, финансирани по тази програма, и изразиха своята увереност, че новата техника ще улесни значително решаването

20 Информационен БЮЛЕТЕН на БАН, брой 12, декември 2006г.

на много конкретни задачи в областта на нано-явленията и нано-технологиите. Приветствие към присъстващите поднесе и зам.-председателят на БАН, акад. К. Косев. Доказаният на срещата, ст.н.с. I ст. Хр. Нанев, благодари за поздравите.

Представени бяха най-ново поколение сканиращ електронен микроскоп на японската фирма JEOL, JSM-6350,комплектован със система за рентгенова енергийна дисперсионна спектроскопия INCA Energy 350; микроскоп за отразена светлина „Axiovert“ 200 MAT, предназначен за микроинтерферометрично изследване на тънки течни филми; допълнителен модул към диференциален сканиращ калориметър за високотемпературни измервания. Акад. Д. Ексерова, ст.н.с. И. Аврамов, ст.н.с. М. Маринов и ст.н.с. Хр. Христов демонстрираха новите апарати и възможностите, които те дават за изследване на нано-структури и явления в обем и на повърхности.

Ст.н.с. I ст. д-р Христо Нанев

There is also a detailed announcement on the NANOPHEN project-related website <http://ipchp.ipc.bas.bg/Nanophen>.

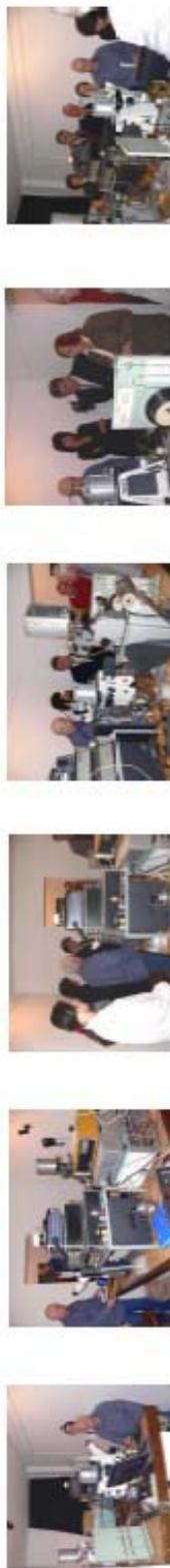
Presentation of the upgraded equipment at IPC BAS (NANOPHEN project INCO-CT-2005-016696)



Welcoming the visitors from the Ministry of Education and Science and Bulgarian Academy of Sciences Institutes



Visit at the Electron Microscopy Laboratory – demonstration of capabilities and advantages of the Scanning EM JEOL 6390 with the Energy Dispersive Spectroscopy INCA system



Visit at the Laboratory for microinterferometric measuring techniques of surface forces at liquid interfaces. Demonstration of the advantages of the inverted video microscope with recording photometric device.



Getting Acquainted with the upgraded Differential Scanning Calorimetry equipment

7. The project NANOPHEN was presented at the 4th MINAEAST-NET workshop: Preparing the European cooperation in FP 7, Bucharest, 16-17 October, 2006.

Recent activities in nanosciences
and nanotechnologies at the
Bulgarian Academy of Sciences”

Simeon Simeonov, Institute of Solid State Physics, Bulgarian
Academy of Sciences

- Rostislav Kaishev Institute of Physical Chemistry
- Phase Formation and Crystal Growth
- SSA NANOSCALE PHENOMENA AND STRUCTURES IN BULK AND SURFACE PHASES
- Participant: Institute of Physical Chemistry - Bulgarian Academy of Sciences (IPC-BAS)
Coordinator: Assoc. Prof. Dr. Elena Mileva
- Contract no.: INCO-CT-2005-016696
- NANOPHEN International Workshops
- “Nanostructured Materials in Electroplating”
- 25 - 30 March 2006
- Hotel Panorama, Sandanski, Bulgaria
- “Shedding Light on the Nanoworld: Ordered and Disordered Nanostructures”
- 23 - 28 September 2006
- “Sunny Beach” Coast Line Resort, Black Sea, BULGARIA



4th MINAEAST-NET workshop: Preparing the European cooperation in FP7
Bucharest, 16-17 October 2006



4th MINAEAST-NET workshop: Preparing the European cooperation in FP7
Bucharest, 16-17 October 2006

8. At the 7th NATIONAL WORKSHOP on NANOSCIENCE and NANOTECHNOLOGY, which took place in November 24-25, 2005 in Sofia Elena Mileva, coordinator of NANOPHEN and chair of the Section “Bioinspired concepts and medical applications” in the National Center for Nanotechnology (NCNT) has presented a report “Bioinspired concepts and medical applications”. The latter can be found on NANOPHEN web-site <http://www.ipc.bas.bg/Nanophen/T15/index.html>.
9. An announcement about the second International Workshop “Nanoscale Phenomena in Colloid and Interface Science” (NPCIS’07) have been published in the quarterly of the International Association of Colloid and Interfaces Scientists (IACIS):



10. An article by one of the members of the Organising Committee of the NANOPHEN **International Workshop “Nanoscale Phenomena in Colloid and Interface Science” (NPCIS’07)** Prof. Dimo Platikanov was published in the Official Bulletin of the Bulgarian Academy of Sciences. This article contains an short overview of the activities in the NANOPHEN project with a special attention on the International Workshop



сените доклади бяха 26. На I Международен симпозиум по радиационна и космическа плазма участваха 65 участници, сред които 17 японски учени. Това беше най-голямата чуждестранна група. Изнесените доклади и тези на нощен семинар бяха 47. Направо вълнува и работата на трите конференции през юни-юли 2007 г., са участвали 340 учени, сред които 240 от България и 100 от общо 29 държави. След тях се откриват по свои брой американската група (14), немската (9) и белгийската и италианската – с по 8 участници. Респективно брой на чуждестранните участници по-горе за международното признание, което имахме. Успехът от докладите на симпозиума 3 конференции са съществени и вина с брой от 140 стр.

Организирането на тези юбилейни конференции отива доста силно да промотират и организационните комитети, както и на техните секретари. Включи те се свързва много добре с възможностите приоритетности и проблем и адресирани за създаването на положителна научна атмосфера за контакти, обща на информацията,

уtvrждаване на досега съществуващите и изграждане на нови форми на сътрудничеството по актуални проблеми на междоотделна и информатиката. Изказваме дълбока благодарност към всички, които съдействаха за събствването по дни докладни книги на 60-годишния юбилей на ИИМ. Периодично споделяме благодарности за остават дни много по-на строгите на Симпозиума, но на желанието от ИИМ те са добре изяснени.

В тази ситиризирана и напечатана с наукометрични данни информация за конференциите, посветени на юбилея на Института, съставяме лес са включени имената на някои изтъкнати и нови и чуждестранни участници, защото, споменили само тях, това означава да бъдат поменени много утвърдени специалисти с достойно признание в математиката и информатиката. По-подробна информация може да бъде намерена в New Trends in Mathematics and Informatics, Jubilee International Conference 60 years Institute of Mathematics and Informatics, Bulgarian Academy of Sciences, Abstracts, Sofia, 6-8 July, 2007.



Главните тези на Международния уоркшоп „Nanoscale Phenomena in Colloid and Interface Science“ бяха да се престави съвременното състояние на тази научна област, да се идентифицират тенденциите за нейното бъдещо развитие и да се обмислят новите възможности за сътрудничеството с европейските наукометрични институции. Основните тези, застъпени в уоркшопите, включваха: механизми от дименсионна и наноструктури при твърдите течни фази, колоидните дисперсии, пени и емулсии, електроосици, наноелектроника и мултидисциплинарни и саморегулиращи се аморфни системи.

Димо Платианов
МЕЖДУНАРОДЕН УОРКШОП „NANOSCALE PHENOMENA IN COLLOID AND INTERFACE SCIENCE“

Един от основите Центрове за превъзходство (Centers of Excellence), създадени в Българската академия на науките, е Центърът за иррадиация „Nanoscale Phenomena and Processes in Bulk and Surface Phases“ (NANOPHEN) към Института по физикоматематика „Петрица Канюкова“ (ИФМ) при БАН, съгласно европейския проект INCO-CT-2005-016696 от Шестата рамкова програма на Европейския съюз. Чрез този Център за превъзходство Института по физикоматематика извършва голямо по обем финансиране, което позволява значително облекчаване на условията за експериментални изследвания. Освен това по този проект беше завършено провеждането на три международни уоркшопа по прите основни научни направления на ИФМ. Първият два бяха проведени през 2005 и 2006 г., а третият, под названието „Nanoscale Phenomena in Colloid and Interface Science“, се състоя от 30 до 22 септември 2007 г. в Пловдив.

Международният уоркшоп „Nanoscale Phenomena in Colloid and Interface Science“ беше подготвен от Организационния комитет към Института по физикоматематика „Петрица Канюкова“, БАН, в състав акад. Ескерова, чл.-кор. Стефанова (съ-председатели), ст.н.с. Христов (секретар), проф. Платианов, ст.д.с. Мелнива (координатор на „NANOPHEN“), ст.д.с. Коен,

и ст.д.с. Топчирев. Той се проведе в Парк хотел „Илирида“ в Пловдив, където се състояха научните заседания, а в тях бяха изнесени всички заседания по време на конференцията. Това престави на 34-мата чуждестранни и 43-мата български участници отлични възможности за дискусии и контакти както сесияте по програмата.

В рамките на програмата бяха изнесени 18 доклади, докладни от видни учени от Европа: Miller, Willard, Schödlbauer и Vain (Германия), Uchida, Tabei и Shtegov от (Великобритания), Крушкова и Болдинни (Русия), Delgado и Samperio (Испания), Luchina (Осация), Liggett (Италия), Surovskiy (Израел), Malysa (Полша), Ross (Израел), Pekar (Гърция) и Scales (Австралия, по-рано от ИФМ). Към уоркшопите бяха проведени изследвания и от чужбина дойдоха още 16 участници, осем от германските 11 страни, още от Ирак и Украйна. От България участваха 22 специалисти на ИФМ – БАН, 15 – от Софийския университет „Св. Кирил и Методи“ и 6 – от други университети и институти на БАН. Общо 77 участници имаше в Международния уоркшоп, като почти половината от тях, както български, така и чуждестранни, бяха млади учени и докторанти. Освен споменатите 18 юбилейни доклади бяха изнесени още 22 устни съобщения и бяха представени 25 posters.

Имаше възможности за продължителни информативни дискусии, които допринесоха за изясняването на редица области от взаимен научен интерес между българските и европейски учени, съветни установяване на сътрудничеството, кандидатстване за съвместни европейски проекти, спонсорствата на млади учени и т.н.

За голям брой участници млади учени и докторанти уоркшопите бяха един чудесен шанс да мулт държави на изтъкнати европейски учени, именно да могат да контактуват с тях, да докладват пред висококвалифицираната аудитория своите научни резултати и т.н.

Този успех на Международния уоркшоп „Nanoscale Phenomena in Colloid and Interface Science“ беше задоволеността от оновите на редица видни учени – участници в уоркшопите. Ще запазваме с един отговор на пожелания германски учен Dr-habil. Reinhard Miller, ръководител на секция в Макс Планк Института по химията и полимерите в Палсамунгем, Германия, главен редактор на престижното списание Advances in Colloid and Interface Science, член на Работната група на International Association of Colloid and Interface Scientists (IACIS). Този уоркшоп беше отлично организиран, той привнесе много изтъкнати учени и представителна група бяха на изградил междоотделна сфера. Това е заслуга на организаторите, на вас двамата акад. Ескерова и чл.-кор. Стефанова, бяха изключително и хората зал вас, което направиха срещата една голяма успех. Освен високото ниво на науката, име създавателите една много приятелски и плодотворна атмосфера. Контактът с младото поколение беше благоприятен от забавите пестери. И аз установих, че се състоят изключително ефективни обмени между младите учени. Те използват такива помощни възможности да взаимоделиват едни с други и да изградят една мрежа за бъдещето“.

11. On February 23, 2007 the Deputy Coordinator of NANOPHEN – Vessela Tsakova has participated in a **Round Table Discussion** organized by the Center of Multifunctional Materials and New Processes with Environmental Impact (Project

MISSION, INCO-CT-2005-016414), established in the Institute of General and Inorganic Chemistry. The discussions were aimed at the details in the preparation of Bulgarian research community for participation in various EC Programs, related to the Infrastructural funds. The discussion was related also to the Priorities of the FP7 program “Development of competitiveness” of the Bulgarian industry in the period 2007-2013 – a factor for economic growth”. Particular attention was also paid on the problems of the Science-Industry partnership and its role for successful project application in various types of FP7 calls.

12. The project coordinator Elena Mileva has presented the basic aims and achievement of the Center of Excellence for Nanoscale Phenomena and Structures in Bulk and Surface Phases in the September 2007 issue of The Parliament Magazine. This Magazine is distributed among the high EU officials in Brussels and Strasburg, and also among the Members of the EU Parliament (see Appendix 3).



13. In the March, 2008 issue of the Official Bulletin of the Bulgarian Academy of Sciences an announcement was published about the book “Nanoscale Phenomena and Structures“, ed. by D. Kashchiev, Prof. Marin Drinov Academic Publishing House, Sofia. This is the Proceedings Book of the final NANOPHEN International Conference “**Nanoscale Phenomena and Structures in Bulk and Surface Phases**” (NPS’08), which took place in February 26- March 02, 2008.



14. A **Joint Meeting of the National Innovation Council and the Coordination Council of the National Center of Nanotechnology** took place on June 30, 2006 and was devoted to the promotion of the national policy in Innovations and the role of Nanosciences and Nanotechnologies. The Head of one of the Departments in IPC-BAS, **Nikolay Boshkov** has delivered an oral presentation **“Ideas against corrosion”**. A special **information book** was issued presented a range of research accomplishments in the field of NMP, related to direct application in industry and medicine (see Appendix 4).

НАЦИОНАЛЕН ЦЕНТЪР ПО НАНОТЕХНОЛОГИИ
ПРИ БЪЛГАРСКА АКАДЕМИЯ НА НАУКИТЕ

Национален информационен ден по нанотехнологии

ПРОГРАМА
АБСТРАКТИ

30 юни 2006
София

Открито съвместно заседание
на
Националния съвет по иновации и
Националния координационен съвет
по нанотехнологии

30 юни 2006 г. от 10:00 часа, БАН – Централно управление, голем салон

ДНЕВЕН РЕД

9:30 – 10:00 Регистрация

Откриване 10:00 – 11:15 I част – национална иновационна политика

Модератор:
Детелица Симикова, заместник на министъра на икономиката и енергетиката

Участници:

- Румен Овчаров – министър на икономиката и енергетиката
- Даниел Вълчев – заместник министър-председател, министър на образованието и науката
- Акад. Иван Юнковиц – председател на БАН
- Симеон Николов – заместник министър на отбраната
- Пламен Балков – председател на ДАИТС
- Божидар Божиков – председател на БТПП
- Божидар Данев – председател на БСК

Корте жауза
11:30 – 14:00 II част – Възможности на нанотехнологиите

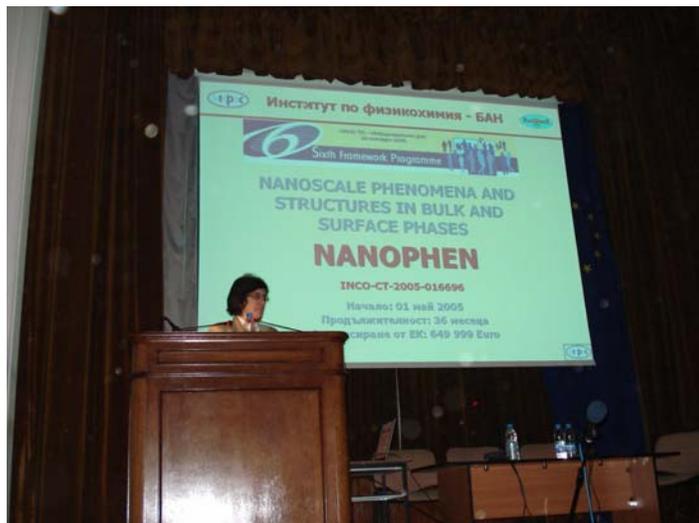
Модератори:
Маргарита Апостолова – Национален координационен съвет по нанотехнологии
Румен Радев – Асоциация на индустриалния капитал в България

1. Ст. н. с. |от Иван Драгичев – Институт по електроника и енергийни системи (БАН), Председател на Националния координационен съвет по нанотехнологии. **Представяне:** „Злато нанотехнологии“
2. Подп. инж. Красимир Гроздев – Министерство на Отбраната, Директор „Департамент по въоръжаването и техниката“ (БАН), **Представяне:** „Силно поле на технически решения в страната и чужбина“
3. Ст. н. с. Николай Божиков, инж. Румен Вилчев – Институт по физикохимия (БАН), Директор ООД „Технохим“, **Представяне:** „Денис Овчаковски“
4. Проф. Ставри Ставров – Институт по корозионни процеси (БАН), **Представяне:** „Нанодиагностика – перспективни технологии за приложението им“
5. Д-р. Д-р. Д-р. Петър Колев – „Биоимити“ ООД в Русенски университет „Апел Княжев“, **Представяне:** „Адаптиране и внедряване в производството на нови продукти“
6. Ст. н. с. Генчо Данев – Централна лаборатория по фотопроцеси (БАН), **Представяне:** „Наноматериалите: възможности и проблеми“
7. Ст. н. с. Боряна Захарова – Централна лаборатория по минералогия и кристалография (БАН), **Представяне:** „Наноразмерни феномени в минералите“
8. Ст. н. с. Маргарита Апостолова – Институт по Молекулярна Биология (БАН), **Представяне:** „Наноструктури и коварски космос“
9. Ръководител – Администратор на големи корпоративни кредити, Райфинанс Банк – България ЕАД **Представяне:** „Стратегия за превръщане на новите технологии в двигатели на българската икономика“
10. Министерство на икономиката и енергетиката **Представяне:** „Оборони програми в България“

Дискусия:
Популяризиране на добрите практики.
Представяне възможностите на институти и учебни заведения за решаване на проблеми на сградите от икономиката

15. At **8th NATIONAL WORKSHOP on NANOSCIENCE and NANOTECHNOLOGY**, which took place in November 20-22, 2006 in Sofia

INFO-DAY of 7FP took place. The Coordinator of NANOPHEN Elena Mileva presented an overview of the project implementation: “**NANOPHEN: Activities of IPC-BAS in NMP**”. Her presentation was put on the web-page of the Ministry of Education and Science (http://www.nsfb.net/system/storage/INFO-DAY-22NO_06.pdf). Elena Mieva has received a special gratitude from Prof. Iovka Dragieva for her work in the NCNT and for the organization and development of the activities in the Section in NCNT “Bioinspired concepts and medical applications”



16. In the third year of the project implementation the National Center for Nanotechnology organized the 9th **NATIONAL WORKSHOP on NANOSCIENCE & NANOTECHNOLOGY**, November 28-29, 2007 Vessela Tsakova, Deputy coordinator of NANOPHEN presented a report on the practical implementation and aftermaths of the project NANOPHEN.

SECTION 3 – PROJECT MANAGEMENT

WP 5 Management of NANOPHEN

T 5- 1: Planning, monitoring and progress reporting

The aim was to monitor the project implementation according to the planned time table and to ensure the financial and administrative management of the project. The regular monitoring of project implementation was performed on the monthly meetings of the Executive Committee. On the **first meeting of the Project Core Team** (May 13, 2005) the **operative plan for the implementation of NANOPHEN** was presented and accepted. In December 16, 2005 the meeting of the Project Core Team was devoted to some problems like difficulties with the tender procedures related to the purchase of equipment, and to the complication with the start of Task 1-1 and Task 3-1. Measures to overcome these complications have been proposed and discussed. They proved to be effective and at the end of the first reporting period it became evident that **the project time schedule is fulfilled** as planned. There were neither delays nor any skipped activities.

In the middle of the NANOPHEN implementation period (December 07, 2006) the joint meeting of the Project Core Team and the whole scientific staff of IPC-BAS was devoted to the **progress of the Project**. All Project Managers and the Coordinator have given overviews of NANOPHEN implementation and current status. The analysis showed that practically about 90% of the staff is involved in project-related activities and initiatives. One conclusion was that the management has been effective so far and **the project time schedule is fulfilled** as planned. There were neither delays nor any skipped activities. Some typical problems with the accounting procedures and the accuracy of the financial documents have been discussed.

All the **Milestones (M 1-6, Table 2, Section 3)** were issued within the planned time. On a regular basis and following the project timetable, the respective **Deliverables (D 1-19, Table 1, Section 3)** have been sent in due time to the European Commission in Brussels.

T 5-2: Financial management

At the start of the project implementation **special financial forms** have been created by which all payments have been recorded. Specific templates were also used for financial control of tasks T 1-1, T 3-3 and T 4-2, related to the mobility of the scientific staff. Every month the Chief Accountant of IPC-BAS issued **tabular reports** to the Executive Committee where all expenditures throughout the respective period have been registered.

One of the important actions have been to find a certified auditor for the project **audit**. The Executive Committee has obtained 4 offers from independent certified auditors. The one that came from MORENA CONSULT LTD whose offer was most appropriate has been chosen and a contract was signed.

In two cases we have sought the **official advice from the European Commission** authorities. The first time we have asked and received permission for the relocation of

some spared funds from one task to another within the same workpackage activities (WP 2, transfer of funds from Task 2-1 to Task 2-2). The second time we have contacted the financial authorities with a question about the application of financial requirements as juxtaposed to the habitual financial practice according to Bulgarian financial regulations. In both cases we have received the due cooperation and understanding.

In the second and third year all financial issues were tackled according to the internal rules and practice established in the first year of the project. All payments from the NANOPHEN funds were issued only after decision of the Executive Committee and the corresponding ordinance of the coordinator. The costs incurred in the second and third reporting period were audited and no significant deflections from the rules were found.

On the whole, there are no major deviations from the cost budget and from the planned person months. The unconsumed funds amounting to about 20 000 EUR are distributed among various tasks.

1. In the appointment of young researchers task (T-3-1) there are remaining funds of about 4 400 EUR. Despite the continuous efforts of the NANOPHEN Executive Committee, it was difficult to attract a larger number of young people for starting a scientific career due to the unclear prospects for the financial status of Bulgarian scientists.
2. There are remaining funds of about 4 000 EUR within the management activities (WP 5) This is partially due to the fact that the Third Annual Meeting of NANOPHEN was combined with the International conference held in Sofia and thus the costs for the International Expert Group members participating in both events were minimised.
3. Remaining funds (about 2 700 EUR) within the participation in the preparation of new applications for FP6 and FP7 projects task (T-1-2) are due to the fact that despite the many applications most of the work was implemented through e-mail exchange and rarely through real meetings of the participants.
4. Remaining funds amounting to 2 700 EUR within the Pilot program task (T-3-2) are mainly due to organizational reasons – the lectures were delivered without payment to the lecturers, no costs were due for renting a hall as initially planned.
5. Remaining funds amounting to 2 500 EUR in the Organization of Conferences and Workshops Task (T-4-1) are mainly related to last minute cancellation of foreign participants invited by the Bulgarian host.
6. There are also remaining funds (about 2 300 EUR) in the Participation in Summer schools and training task (T-3-3) due to certain delayed response of the young researchers initiative especially in the first year of the project.

T 5-3: Organizational management

This task is related to the organization of the planned activities and the technical management of individual work packages, the link together of all project components and the maintenance of the regular communication with the European Commission, the organization of regular Executive Committee, Governing Board, International Expert Group and Annual Expert Meetings. In order to help the organizational management a **technical assistant** was appointed (Dimitrinka Arabadzhieva). She dealt with all the

technical details of the organization of the meetings and the proper keeping and maintenance of the project documentation.

In the **first reporting period** there have been **fourteen Meetings of the Executive Committee** of NANOPHEN. The schedule of each of these meeting was prepared by the Coordinator, has been duly announced at least one week in advance. On these Meetings all the operative tasks, the actual problems and difficulties related to the implementation of the Project, have been thoroughly discussed and recorded. The decisions of the ExeC have always been taken by consensus. There have also been **three Meetings of Project Core Team**. All of these were also attended by the Chief Accountant of IPC-BAS. One of them (June 10, 2005) played the role of a **Kick-off Meeting**. This meeting was open for the whole scientific and technical staff of IPC and was devoted to the thorough presentation of all the possibilities offered by the various activities of NANOPHEN. It was also attended by BAS officials and guests from other BAS institutes of similar scientific profile which have also running projects in the 6th FP of the European Union.

Following the end of the reporting period the **First NANOPHEN Annual Meeting** took place in May 11, 2006. Besides the Project Core Team, it was attended by all the members of the **International Expert Group (InEG)**. The latter consisted of top European scientists in NMP thematic priority and particularly in the main thematic areas of the project related activities. On this meeting the NANOPHEN progress was reviewed and discussed.

The Coordinator and the workpackage managers (WPMs) have given a detailed report on the project activities, the problems encountered in the course of the project implementation and the achievements of the first reporting period. In the afternoon session of the Annual Meeting the members of the International Expert group have given their opinion on the progress of the project, formulated recommendations on the next year activities. Particular attention was paid on the problems with finding and detaining prospective young scientists in natural science in general, and in IPC-BAS in particular. The members of the International Expert Group have shared their experience in finding the appropriate cooperative partners.

Following the initial project management time schedule, in the **second reporting period** there have been **twelve Meetings of the Executive Committee** of NANOPHEN. There have also been **two Meetings of Project Core Team**. All of these were also attended by the Chief Accountant of IPC-BAS.

At the end of the second reporting period the **Second NANOPHEN Annual Meeting** took place in April 21, 2007. Besides the Project Core Team, it was attended by all the members of the **International Expert Group (InEG)**.

During the final third year of the NANOPHEN implementation there have been **twelve Meetings of the Executive Committee** of NANOPHEN. There have been no special Meetings of Project Core Team.

The **Final NANOPHEN Annual Meeting** took place on March 01, 2008 (see Minutes in Appendix 6). The program was comprised of two stages: In the first stage the Coordinator of the project Elena Mileva presented her overview of the three year NANOPHEN implementation. She gave a thorough analysis of the impact of the EC funding through NANOPHEN for the research prospects of IPC-BAS. She concluded that the NANOPHEN project goals have been fully achieved as planned. The sharp improvement of the material and human resources of the Institute has strengthened the

position of IPC-BAS on a national level. IPC-BAS has really been converted into a **high-level European research and advanced-training Center in the field of NMP.**

The members of the Executive Committee of NANOPHEN have also shared their opinion, particularly with regard to the specific tasks in the different workpackages. They analyzed the achievements and future prospects related to the various activities. The general conclusion was that the EC funding has stirred a whole range of scientific and collaborative activities which both in quality and quantity are unprecedented within the 50-year existence of the Institute.

In the second stage there have been a round-table discussion. Some major concerns were deliberated regarding the aftermaths of NANOPHEN in the near future, the national policy about science and scientific priorities. It was outlined that the first two years of the NANOPHEN implementation were marked by efforts to stabilize and improve significantly the material resources (by upgrading key equipment units) and the human potential (opening new job positions and implementation of the Pilot Program for multidisciplinary training of the in the field of NMP. These actions were more or less well-defined and envisaged in detail in the NANOPHEN workplan. Due to the substantial EC funding these created a true atmosphere of focused research and trainin. In contrast, the third year was marked with various activities that demanded personal activity and active position of the research staff of IPC-BAS (dissemination of knowledge, exchange of personnel and knowledge, participation in various scientific events). So, in a way, the third year was a real “breakthrough” which marked the new position of the **IPC-BAS has already become an integral constituent of ERA.**

T 5-4: Women in Science

Women researchers in IPC-BAS has actively participated in the implementation of the project NANOPHEN. A special Deliverable has been issued to the EC in the midterm of the project duration (**D 8**, Table 1, Section 3). The various activities might be described as follows:

1. Participation in the Executive Committee of NANOPHEN

The Executive Committee of NANOPHEN consists of 5 members, 3 of them are women scientists:

- *Elena Mileva* – Coordinator of NANOPHEN;
- *Vessela Tsakova* - Deputy Coordinator of NANOPHEN, Workpackage Manager of WP 5;
- *Tsetska Radeva* - Workpackage Manager of WP 3.

2. Participation in the Core Project Team (Task managers)

The Project Core Team consists of 15 experienced scientists, 4 of them are women:

Elena Mileva – Task Manager of T-3-1, T-3-2, T-5-3;

Vessela Tsakova - Task Manager of T-3-1, T-5-1;

Tsetska Radeva - Task Manager of T-1-4, T-5-2;

Dotchi Exerowa - Task Manager of T-1-1, T-2-1, T-5-4.

3. Participation in the activities of NANOPHEN:

WP 1: Enhancing collaboration with similar institutions in MS

Here the most active participation of women scientists is in T-1-1 (Organizing exchange of personnel and of joint experiments), T-1-4 (Initiating new networks) and T-1-5 (Participation in the activities of National Council of Nanotechnology).

Totally 22 research visits were realized in T-1-1, and eleven of them are by women researchers.

The major initiative of IPC-BAS in T-1-4 project NANOPHEN, namely the was the implementation of CONductive POLYmer Expert (CONPOEX) Meeting, held in Borovets, Bulgaria, April 17-20, 2008 was organized by *Vessela Tsakova*.

The participation in the activities of the National Center of Nanotechnology (NCNT) is traditional for our Institute. *Elena Mileva*, Coordinator of NANOPHEN, is Head of the Section "Bioinspired concepts and medical application". In the period of implementation of NANOPHEN we have participated in all of its major initiatives:

- On the National Day of Nanotechnology in June 2005, the Deputy Coordinator *Vessela Tsakova* has delivered an oral presentation "NANOPHEN – IPC-BAS in the European Research Area (<http://www.ipc.bas.bg/Nanophen/index.html>).
- *Elena Mileva*, Coordinator of NANOPHEN is a member of the Organizing Committee of NANO'05 and is responsible for the topic Bioinspired Concepts and Medical Applications. She has a report on this topic.
- The project NANOPHEN has been a **co-organizer** of a Satellite Seminar to the 7th Workshop on "Nanoscience and Nanotechnology" entitled "**Bulgarian WomenInScience'2005**", which was held November 26, 2005. The task manager *Dotchi Exerowa* has put forward a presentation on the activities of the project NANOPHEN and the women-in-science related activities in the project.

WP 2: Upgrading key IPC equipment and electronic communication tools

Dotchi Exerowa, the Task manager of T-2-1, has been the leading figure in the organization and the purchase of modules for the upgrade of the microinterferometric techniques for measuring surface forces at liquid interfaces. *Vessela Tsakova* and *Radost Paskova* have participated in the tender procedures for the purchase of the new scanning electron microscope with instrumentation for EDX-analysis and the equipment for differential scanning calorimetry and termogravimetry.

WP 3: Creating new career prospects for young researchers

Seven out of twenty one new job positions have been occupied by young female researchers. Among the 15 Bulgarian lecturers in the Pilot program for coupled multi-disciplinary training and fundamental knowledge on nanoscale phenomena (T-3-1) 6 are women researchers (see also **D 4**, Table 1, Section 3). They have prepared 12 out of 30 lectures.

In the technical editing and preparation of the CD and the book of lectures, take part the PhD students *Teodora Zapryanova* and *Kamelia Kamburova*.

WP 4: Dissemination of knowledge

Three exploratory workshops have been organized by now:

1. "Nanostructured Materials in Electroplating" with a satellite round table, Sandanski, March 2006. The workshop was attended by 25 Bulgarian scientists, 14 of them

were female researchers. They participated in 17 presentations, out of total number of 36. Following the workshop a book entitled “Nanostructured Materials in Electroplating” (ISBN-10:954-07-2378-7, St. Kliment Ohridski University Press, 2006, Eds. D.Stoychev, E.Valova, I.Krastev, N.Atanassov) was published. It comprises invited lectures and poster presentations in full text. Among the Editors of the Book of lectures one was a woman scientist, *Evgenia Valova* (Appendix 4, see also Deliverable 5). *Tsvetina Dobrovoltska* and *Dessislava Nikolova* have participated in the elaboration of the CD with all the presentations (see also Deliverable 5).

2. “Shedding Light on the Nanoworld: Ordered and Disordered Nanostructures”, “Sunny Beach” Coast Line Resort, September 2006. In the Organizing Committee out of six members, three are women: *Vessela Tsakova*, *Radost Paskova* and *Dobrinka Andreeva*. The workshop was attended by 45 scientists, 9 of them were female researchers. They presented 3 oral and 9 poster presentations, out of 26 and 21 respectively. The Satellite First non-VIRTUAL Meeting “Instabilities at Surfaces” was attended by 31 participants with 1 Bulgarian women researcher – *Tsvetina Dobrovoltska*, who had an oral presentation.
3. The third NANOPHEN workshop, “Nanoscale Phenomena in Colloid and Interface Science” was in Plovdiv, September 20-22, 2007. The Organizational Committee was headed by *Dotchi Exerowa*, out of seven members four are women: *Elena Mileva*, *Rachel Cohen*, *Ivana Petkanchin* and *Dobrinka Andreeva*. The Workshop program consisted of 18 invited lectures and 22 oral contributions. In the poster session, 25 posters were presented and discussed. A total of 76 scientists attended the workshop, 28 of which were female. Among the Bulgarian participants 22 were from IPC-BAS and 12 were women scientists, and they delivered 5 oral and 8 poster contributions.
4. The final International Conference “Nanoscale Phenomena and Structures in Bulk and Surface Phases” (NPS’08). The Conference program includes 17 invited lectures as well as 21 oral and 53 poster presentations. Of them 6 were oral presentations and 9 were poster presentations delivered by women researchers.

Particularly intensive was the participation of IPC-BAS scientists in international scientific events. By now, NANOPHEN has financed 45 participations with 53 presentations. Out of them 22 participations and 26 presentations were delivered by women researchers.

WP 5: Management of NANOPHEN

The activities in this package are totally operated by women scientists: *Elena Mileva*, *Vessela Tsakova*, *Dotchi Exerowa* and *Tsetska Radeva*. The role of technical assistance to the management is played by *Dimi Arabadzhieva*.

Table 1: Deliverables list of project NANOPHEN

Del. No.	Deliverable name	WP No	Date due	Actual delivery date	Estimated indicative person-months	Used indicative person - months
D 1	Project presentation and initial Plan for using and dissemination of knowledge	WP 5	July 31 2005	July 30, 2005	1	1
D 2	Report on the prospective needs for access to unique equipment and joint experiments of IPC-BAS researchers and schedule for provisional exchange of scientists	WP 1	October 31, 2005	December 5, 2005	1	1
D 3	Data base of VIRT containing addresses of participants, pre-publication presentations and a list of research hot-topics	WP 1	April 30, 2006	June 9, 2006	3	3
D 4	A coherent program of lecture series on nanoscale phenomena in bulk and surface phases targeted at young researchers and PhD students	WP 3	April 30, 2006	June 9, 2006	3	3
D 5	Expert report on the results and prospects of further development of the NANOPHEN in the area "Nanostructured materials in electroplating"	WP 4	April 30, 2006	June 9, 2006	1	1
D 6	Progress report to the Commission for the first year of NANOPHEN	WP 5	April 30, 2006	June 9, 2006	1	1
D 7	Report on the increased technical possibilities of the IPC research equipment and electronic communication system.	WP 2	October 31, 2006	December 05, 2006	1	1
D 8	Report on the participation of women scientists in the activities of the project	WP 5	October 31, 2006	December 05, 2006	1	1
D 9	Program for multidisciplinary practical training on nanoscale phenomena and structures in bulk and surface phases	WP 3	April 30, 2007	June 08, 2007	3	3

D 10	Expert report on the results and prospects of further development of the NANOPHEN in the area "Ordered and disordered nanostructures"	WP 4	April 30, 2007	June 08, 2007	1	1
D 11	Progress report to the Commission for the second year of NANOPHEN	WP 5	April 30, 2007	June 08, 2007	1	1
D 12	Expert report on the results and prospects of further development of the NANOPHEN in the area "Nanoscale phenomena in colloid and interface science"	WP 4	October 31, 2007	December, 10, 2007	1	1
D 13	Book of key lectures delivered on the lecture series of the Pilot Program	WP 3	October 31, 2007	December, 10, 2007	1	1
D 14	Report on the participation of IPC-BAS researchers in new initiatives of the European Frame programs and in other collaborative European projects.	WP 1	April 30, 2008	June 10, 2008	1	1
D 15	Proceedings of the international conference "Nanoscale phenomena and structures in bulk and surface phases"	WP 4	April 30, 2008	June 12, 2008	3	3
D 16	Report on raising public participation and awareness	WP 4	April 30, 2008	June 12, 2008	1	1
D 17	Report on the participation of IPC-BAS scientists in international meetings (conferences, workshops, symposia)	WP 4	April 30, 2008	June 12, 2008	1	1
D 18	Final Plan for using and dissemination of knowledge	WP 5	April 30, 2008	June 10, 2008	1	2
D 19	Final report to the Commission	WP 5	April 30, 2008	June 12, 2008	1	2

Table 2: Milestones list of project NANOPHEN

Milestone No.	Milestone name	WP No	Date due	Actual delivery date
M 1	Identification of the prospective needs for access to unique equipment in MS partner institutions and joint experiments of IPC-BAS researchers.	WP 1	6 th	6 th
M 2	Creation of a virtual medium for scientific exchange and networking (VIRT).	WP 1	6 th	6 th
M 3	Setting into operation the upgraded scientific equipments. The expected result will be the increased technical and methodological capacities of IPC-BAS	WP 2,	15 th	15 th
M 4	Outlining a strategy for coupling multidisciplinary practical training and gaining of fundamental knowledge in the field of NANOPHEN.	WP 3	6 th	6 th
M 5	Elaboration of a project-related website.	WP 4	3 th	3 th