



## Boosting EU-Ukraine cooperation in the field of Superhard Materials

### NEWSLETTER No 6

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2nd intensive FP7 training course in Kiev	
<b>Title</b>	On-the-job training in France
<b>Date</b>	11 - 15 November, 2013
<b>Venue</b>	2 Avtozavodska St., Kyiv, Ukraine
<b>Organizer</b>	V.N. Bakul Institute for Superhard Materials (ISM) of the National Academy of Science
<b>Participants</b>	30 young scientists and 3 trainers from the consortium partners visited the training course.
<b>Number of participants</b>	33

The «2nd intensive FP7 training course» was held on 11-15 November 2013 in Kiev, Ukraine. The course has been designed within the context of the START project. This was the second round of the «intensive training courses» planned under START focusing on ISM's researchers from its various departments/laboratories/teams aiming to assist them in understanding the proposal submission process under the HORIZON2020 framework programme.

The overall objective of the course was to «cover» the entire process «from a research idea to a research proposal», offering to ISM's researchers the opportunity to experience this process and improve their understanding on the proposal preparation procedure. Moreover, the course was adjusted to ISM's needs, namely to be involved in EU-funded projects as a «partner».

The methodology courses was based on the «learning by doing» («experiential learning») concept so as to «simulate» the time-pressing and stressful procedure of proposal preparation and offer a «close to real» experience to ISM's researchers. More specifically, the trainees were grouped in small teams (4-5 researchers in each team) and prepared several sections of a proposal guided by experienced proposal writers. Each part of the proposal (assignment) addressed a number of topics that correspond to the criteria used for evaluating the proposals.

Course was conducted by experts from France and Greece for proposal preparation and project implementation.



The trainers from the consortium partners.



Participants of the course

Research internships - 2nd round	
<b>Title</b>	Research internships 2 <sup>nd</sup> round
<b>Date</b>	14 May – 23 November , 2013
<b>Venue</b>	Universite de Poitiers, CNRS/ Laboratoire PHYMAT, UMR 6630 CNRS-Universite de Poitiers SP2MI, BP 30179, F-86962 ChasseneuilFuturoscopeCedex, France. Institute of High Pressure Physics of the Polish Academy of Sciences (UNIPRESS). V.N.Bakul Institute for Superhard Materials of National Academy of Science of Ukraine.
<b>Organizer</b>	V.N. Bakul Institute for SuperhardMaterials of the National Academy of Science
<b>Participants</b>	Group of ISM’s young scientists, consortium partners

The second round of Research internships consisted of four parts, namely:

- 14- 26 May 2013, Universite de Poitiers, Laboratoire PHYMAT CNRS/, Poitiers, France(participant: Dr. TetianaSerbeniuk);
- 15-28 September2013, Institute of High Pressure Physics of the Polish Academy of Sciences (UNIPRESS), Warsaw, Poland (participant: Ph.D. student TetianaKolabylina);
- 15-28 September2013, Institute of High Pressure Physics of the Polish Academy of Sciences (UNIPRESS), Warsaw, PolandPh.D. (participant: student OlhaIevdokymova);
- 10-23 November2013, Institute for Superhard Materials, Kyiv, Ukraine (participants: Prof. Thierry Cabioç’h and Dr. Patrick Chartier).

Objectives of all activities planned and carried out during the visit were as close as possible of new perspective project proposals for Program HORIZON 2020 and other in the direction of manufacturing of new tool composite materials based on innovative binders, synthesis of new MAX phases for new application, technologies of high pressure food preservation, etc.

In Universite de Poitiers, France Dr. TetianaSerbeniuk with a group of French research partners carried out the research work. The idea of the training was to exchange of young scientific personnel for training into new methodologies, tools, procedures, etc. As a result, Dr T.B. Serbeniuk worked with the modern equipment (box for weighing of charge, mixer for mixing of charge, press to form of compact, vacuum furnace) and synthesis of new solid solutions and studied their crystal structure. All this work has been performed in cooperation with the French researchers under supervision of Prof. T. Cabioç’h and Dr. P. Chartier.



Dr. T.Serbeniuk during the Internship



Equipment for the study of mechanical characteristics

During 16-27 September 2013 Ph.D. student OlhaIevdokymovaand 15-28 September 2013 Ph.D. student TetianaKolabylina worked in the Institute of High Pressure Physics of the Polish Academy of Sciences with Institute UNIPRESS team which consist from: Prof. B. Palosz, Prof. Prof. Malgorzata, M. Leszcynski, Dr. M. Bockowski, Dr. S. Gierlotka, Dr. A. Morawski.

TetianaKolabylina worked in area of “Manufacturing of new tool composite materials based on innovative binders aiming on high performance and new application areas”.The topic of OlhaIevdokymova was “Research on technologies of high pressure food preservation and developing of “active“ packaging polymers modified by bactericidal nanometals”.

Within the research internship young scientists had an excursion in new laboratory building of the Institute of High Pressure Physics. The new laboratory is equipped with modern equipment for research activities. During the

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excursion, the participants saw the high pressure machines, electron microscopes, new weighing-machine, x-ray machines, etc.



At UNIPRESS new laboratory

The main goals of internships were to move to the next step in creation of project in the frame of HORIZON 2020, and to find missing subcontractors for consortium and formation of new contacts which can help in future scientific investigation and project participation.

According to work plan, developed together with UNIPRESS, activity on the first week was connected to EMRS conference i.e. visiting related lectures, establishing connection with potential partners.

In the first day on Conference EMRS few reports devoted to marketing and promotion of scientific research in the European market were visited. The report "Commercial Product Optimization using Field Flow Fractionation" Fatima Naser, Iseult Lynch, Eugenia Vaisami-Jones University of Birmingham presented a few examples of hasty commercialization scientific developments, and it came not improvement existing material, method, etc., and introduction of a completely new solutions. The report was prepared by a research organization FENAC, which is very interesting for planned research, as an example to follow. A methodology for conducting research, the role and responsibilities of the research group in the consortium diagram of information exchange between members of the consortium was outlined. Next report was submitted by the representatives from Biological and Chemical Research Centre of University of Warsaw.

In addition to description of numerous international projects and grants won by these institutions in various areas of ecology, biology, biophysics, chemistry, etc., report contained interesting information about public activity of the center, which helps to find partners, namely:

- partnership in basic and applied research projects
- scientific collaboration with public and private sectors
- expert studies and commissioned research
- staff training for government and private enterprises
- equipment of conference-hall and numerous rooms for training and research seminars.

Upon completion of the oral reports section, EMRS poster session was visited.

Next day on the plenary part of conference EMRS the plenary speaker Marcin Sadowski, representative European Commission, made report "Materials research in Horizon 2020" where examined in detail the features and differences of HORIZON 2020 from the 7<sup>th</sup> Framework Programme.

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Report of EMRS Plenary speaker Marcin Sadowski



Awarding of Prof. Sylwester Porowski of Jan Czochralski Award and medal

Preliminary agreements about possible involvement in future joint projects within the HORIZON 2020 and the Polish national projects with the scientific employees of the Institute was made after visiting Warsaw Polytechnic Institute. After this visit, the workshop and a sightseeing tour of UNIPRESS were organized for young scientists from Ukraine and other EMRS conference's participants.

Next day at UNIPRESS the EU-Ukraine Partnership Information Day "HORIZON 2020 and R&D&I in Nanotechnology and Advanced Materials" was held. It was organized by ISM (Ukraine), UNIPRESS (Poland) and KPK (Poland) at the Institute of High Pressure Physics of the Polish Academy of Sciences.

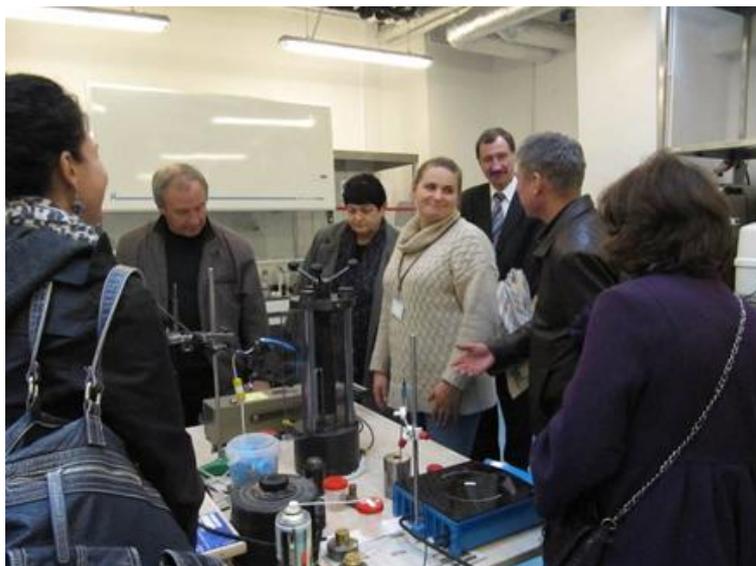


Sightseeing tour of UNIPRESS organized for young scientists from Ukraine

New useful contacts with representatives of scientific organization from Belarus, and Polish industry were established at this meeting. Besides the meeting with colleagues from UNIPRESS, next day were held meetings with the new possible partners from Polish Academy of Science.

Meeting with a group of representatives of ISM was held by deputy dir. Turkevich V.Z. with the deputy Deccan of the Warsaw Polytechnic Institute, prof. Malgorzata Laykovskoy. The meeting contained information about structure and main activities of the Institute.

Next part of Internship was devoted to a tour in UNIPRESS, with the review of devices and installations, which planned to be used in future projects. After a preliminary discussion of the projects planned for submission to the HORIZON 2020 were preinstalled roles of the partners in future projects, a plan of the project, clarified the scientific part.



Ukrainian delegation in the granulometric laboratory of UNIPRESS

The final meeting of the Ukrainian delegation with partners from the START UNIPRESS was headed by Bogdan Palosh. On this meeting was considered such questions as:

- Establishing of early arrangements;
- Compilation of a schedule and a list of participants in future visits;
- Discussion of future project proposals;
- Formation of lists of vacant roles in projects and lists of candidates for these roles.

### Schedule of the Research Internship

15.09.2013	Departure from Kyiv
16.09.2013	Arriving in Warsaw, accommodation in hotel
17.09.2013	meeting with the leaders of the UNIPRESS (developed a work plan)
18.09.2013	Visiting reports on Conference EMRS devoted to marketing and promotion of scientific research in the European market. Upon completion of the oral reports section, was visited a EMRS poster session.
19.09.2013	Visiting Plenary part of E-MRS Fall Meeting
20. 09.2013	Visiting Conference EMRS. Participation in the workshop and a sightseeing tour of UNIPRESS organized for young scientists from Ukraine.
23. 09.2013	Participation in EU-Ukraine Partnership Information Day “HORIZON 2020 and R&D&I in Nanotechnology and Advanced Materials” with discussion of main features of HORIZON 2020;
24. 09.2013	Meeting with Dean of the Warsaw Polytechnic Institute. Visitto laboratories, familiarization with the features of equipment and research capabilities of the Institute.
25. 09.2013	Tour toUNIPRESS, which had the aim to get acquainted with the devices and installations, which planned to be used in future projects. Discussion of the projects planned for submission to the HORIZON 2020
26. 09.2013	The final meeting of Ukrainian delegation with partners from the START UNIPRESS.
27. 09.2013	Departure from Poland
28.09.20113	Arrival to Ukraine

Objective of all activities planned and carried outduring the visitin project proposal in the direction

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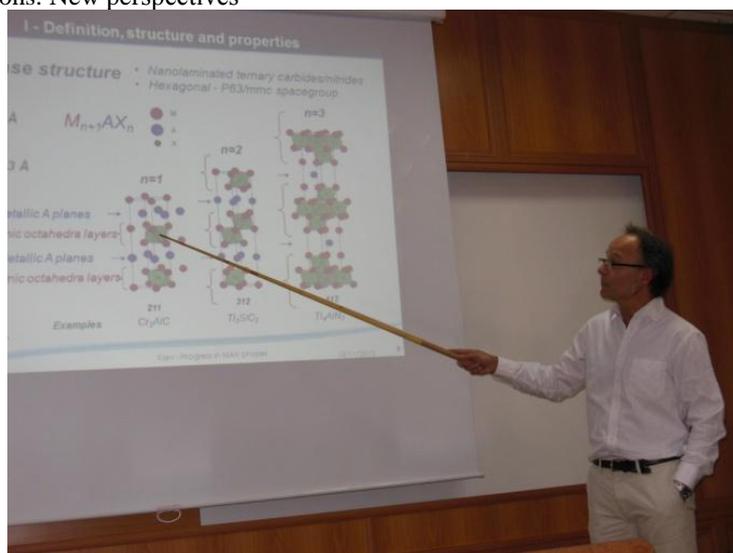
"Manufacturing of new tool composite materials based on innovative binders aiming on high performance and new application areas" was as close as possible to submission. Test measurements were carried out on the equipment that will be used in the planned for submission under Horizon 2020 project. Meetings with representatives of current and potential partner organizations were held. New contacts were established.

During the internship in the Institute for Superhard Materials National Academy of Science of Ukraine on 10-23 November 2013, Prof. T. Cabioch and Dr. P. Chartier were implemented in the group of Ukrainian research partners for two weeks to perform experimental research and outlined the main directions in the area of MAX-phase investigation for future cooperation. Also, Prof. T. Cabioch and Dr. P. Chartier combined the research internship with the 2<sup>nd</sup> Intensive training course, which was held in the ISM during 10-15 November 2013.



With the Ukrainian team. Dr. P. Chartier, Prof. T. Cabioch, Prof. T. Prikhna, Dr. T. Basyuk, Prof. M. Novikov, Prof. O. Bondarenko, PhD O. Starostina.

On the 14 of November Prof. T. Cabioch took the lecture with the title "Progress in MAX phases: from fundamentals to applications. New perspectives"



Presentation of the Prof. T. Cabioch

The last part of internships with participants from Poland (Prof. Sylwester Porowski, PhD. Student Bogdan Sadovyi) consisted from two parts: I part – 17-23 February 2014, II part – 30 March–6 April 2014. They worked with gallium nitride (GaN) which is a semiconducting material for optoelectronic devices.



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Delegation tours in Ukraine, 4 <sup>th</sup> round	
<b>Title</b>	Delegation tours to Ukraine, 4 <sup>th</sup> round
<b>Date</b>	25 – 26 June, 2014
<b>Venue</b>	National Technical University of Ukraine (KPI), Kyiv Institute of Problems of Materials Science (IPMS) NAS of Ukraine, Kyiv V. Bakul Institute for Superhard Materials (ISM)NAS of Ukraine, Kyiv
<b>Organizer</b>	V.N. Bakul Institute for Superhard Materials (ISM) of the National Academy of Science
<b>Participants</b>	Researchers from Poland, France, Germany, Austria.
<b>Number of participants</b>	10

Forth Delegation Tour was organized on June, 25 - June 26, 2014, for researchers from Germany, Poland and France. The main aim was the acquaintance with newest institute's achievements institutions and the most promising areas of research that fit into the development strategy of the European research system and can be implemented in joint project proposals in framework of HORIZON-2020.

Scientific institutes of Ukraine which has been visited by team of foreign researchers are: National Technical University of Ukraine (KPI, Kyiv), Institute of Problems of Materials Science (IPMS) NAS of Ukraine (Kyiv), and Institute for Superhard Materials (ISM) NAS of Ukraine (Kyiv)

**A group of high level EU researchers** participated the Delegation Tour, including:

Prof. Dr. W. Gawalek (Germany), Dr. M. Schwarz (Germany), Dr. M. Eisterer (Austria), Dr. Y. Le Godec (France), Prof. Dr. S. Porowski (Poland), Dr. A. Bakowski (Poland), Prof. J. Noudem (France), Prof. Dr. L. Jaworska (Poland), Prof. Dr. T. Cabioch (France), Dr. M. Albrecht (Germany).

### *National Technical University of Ukraine (KPI, Kyiv)*

Professor P. Loboda shared the latest achievements of the University in the field of integration of higher educational institutions of Ukraine in the international community. Also he turned the attention to research and development achievements of the University in general and the faculty of Engineering Physics which are under his leadership, in particular. Presentation of Professor Loboda aroused a keen interest among the participants of delegations tour.

Especially attention was attracted by the following features:

- Actual ability to create a protective first layer for the reactor of the materials developed at the Faculty
- Creating a strengthened alloy reinforced with nanofibers of metal carbides for use in engineering and as constructional materials.

Also Prof. P. Loboda held a brief tour of the University measurement laboratories and has demonstrated modern equipment which are available for undergraduate and Ph.D. students of the faculty. He told about the nearest plans for the future: establishment of computer simulation laboratory at the Faculty. Main purpose of this lab will be modelling processes of self-organizing in alloys during their preparation and processes occurring through repeated use.

At the end of the visit, the tour participants and host delegations discussed the possibility of joint participation in international research projects involving students and young scientists.



Presentation given by Professor P. Loboda



Participants of Delegation Tour and organizer

***Institute of Problems of Materials Science (IPMS) NAS of Ukraine, Kyiv***

Professor Ragulya presented to the participants of Delegations Tour his institute. He presented the special structure which thanks to pilot production line allows faster and more productive work on the solution of scientific and technological problems. He presented the results of this work shown at the exhibition. Participants of Delegations Tour were impressed with diversity of scientific directions, institute is engaged in. For example, combination of deep research with the solution of specific technical tasks in sphere of biocompatible nanoceramics on the basis of Y and Zr, nano-powders and nano-coaters, synthesis of nano-carbon materials and creation of reinforcing materials on their basis.



In Laboratory with Prof. Dr. S. Firstov



Professor A. Ragulya presents production of laboratory

During the presentation given by Professor A. Ragulya, lively discussion was fastened of possible joint projects in the field of biocompatible ceramics, which are within the scope of interests UNIPRESS. The prospects for cooperation in the field of energy-keeping projects, namely creation of solar panels, as well as hydrogen storage systems were discussed. Also attention was paid to multi component composites as a new class of materials, which still looking for its place among the materials to aviation and mechanical engineering as the material for the space industry and rocket engineering.

Sincemainstreamof modern sciencein Europeis the directionof nano, participants of DelegationTour with high interestvisitedlaboratory of synthesis of nanopowders and coating of them.The prospects ofthis laboratory were discussed, taking into accountthat the technologiys almost readyto enter the market.

***V. Bakul Institute for Superhard Materials (ISM) NAS of Ukraine, Kyiv***

Delegation Tour was crossed paths by the time with the final conference of the project START, carried out 26-



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27 June in ISM. Because of this after sightseeing of the Institute's laboratories, participants of the Delegation Tour could communicate with the young scientists of the ISM in a relaxed atmosphere in sidelines.

Many of young scientists attending the conference had previously taken active part in scientific seminars, training sessions by START project. So, they have found many common themes for discussion with members of the Delegation Tour. This communication is especially valuable because many of them will soon be participating in international projects within HORIZON 2020.

Plan of visit to laboratories was drafted in such a way: after visiting the laboratory participants of Delegation Tour had free time for some issues could be discussed with members of ISM. Questions were raised at discussion mostly related to clarifying of the objectives of the partners and discussing the details of projects planned for the joint submission in HORIZON 2020 at previous meetings.

They discussed how more global issues - establishment of an international research laboratory based on ISM, as well as more specific discussion of candidates-participants of joint projects, undergraduate and graduate students will internships abroad.

### *Conclusions*

Forth Delegation Tour was organized in three Ukrainian big scientific institution, they are National Technical University of Ukraine (KPI, Kyiv), Institute of Problems of Materials Science (IPMS) NAS of Ukraine, Kyiv, V. Bakul Institute for Superhard Materials (ISM) NAS of Ukraine, Kyiv. In the fourth round of the Delegation Tour was attended by representatives from 10 scientific organizations from 4 countries of the EU.

During prior similar events new contacts were established. The areas for joint research activities has been proposed. The main task of this delegation tour was to move further in this direction, transfer the contacts and started earlier joint scientific activities into the formal plane. Upon completion of the project, the collaboration with partners will be continued in the form of projects in Horizon 2020, Marie Curie, NATO projects and Polish national projects.

Thus the main objective of this tour were direct contact between each individual research group and concrete foreign organizations planning to work together in the future.

The final conference of the project START	
<b>Title</b>	The final conference of the project START Boosting EU-Ukraine cooperation in the field of Superhard Materials
<b>Date</b>	26 - 27 June, 2014
<b>Venue</b>	2 AvtozavodskaSt., Kyiv, Ukraine
<b>Organizer</b>	V.N. Bakul Institute for Superhard Materials (ISM) of the National Academy of Science
<b>Participants</b>	92 representatives of different organization took part at the conference. Namely, 27 representatives of institutes, universities, scientific centers, 60 representatives of ISM, 1 participant from consulting organization, 1 representative of business foundation and 3 representative of NGO.
<b>Number of participants</b>	92

The Final Dissemination conference of the project started with the welcome speech of organizers and **the presentation of ISM Strategy – 2020**.

The aim of the ISM Research Strategy 2020 is a long-term development and updating of the V. Bakul Institute for Superhard Materials of the NASU in accordance with the European requirements and standards. The strategy defines the areas of materials science and technology at which the ISM direct the main effort during the next years to reach the European and World leading position. The mission of ISM Research Strategy 2020 is to provide long-term development and enhancement of the role and international status of ISM of NASU as innovational international R&D&I organization in: the branch of development and commercial application of the new competitive function-oriented superhard, superconducting structure-oriented and smart materials processed using innovational high-pressure technologies; to provide intense cooperation between ISM and international scientific centers; to provide instant growth of scientific competence of scientific workers of ISM in preparation and being an active partner of a number of international projects and commercialization of scientific results as well as enhancement of business activities in scientific and technical sphere.



Dr. Y. Nikitin with his report



Participants of conference

**The overview of the project START results** were presented by the project START coordinator, **Dr. Y. Nikitin**, ISM, Kiev, Ukraine. Overall progress per tasks for all work packages including submitted deliverables and milestones have been presented. The main goals of the WP2 are development of the ISM's Research Strategy 2020 and 5 project proposals were prepared for EU funds. Under WP3, 2 rounds of on-the-job FP7 trainings, 2 FP7 training

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workshops, 3 FP7 intensive training courses have been organized. Overall progress per tasks for WP4 such as developed 12 “PR profiles” and 16 “Technology Offers”, organised 4 round of delegation tours, 2 scientific seminars and 2 rounds of research internships, participation of ISM scientists in International Conferences and workshops and Joint Research Action Plan with leading EU research centres have been presented. Promotion campaign (WP5) was based on preparation of project's logo, slogan, leaflet, web-site, e-newsletters, info-days, Project Dissemination Strategy, International Dissemination Conference and Post-project Exploitation plan.



Conference speakers

Representative of Atominstitut, Vienna University of Technology (Austria), **Dr. M. Eisterer** introduced **Granularity effects in high-temperature superconductors: MgB<sub>2</sub> and iron based compounds**. The next presentation made by **Dr. M. Schwarz**, TU Bergakademie Freiberg (Germany) contained information about the **high pressure forms of Si<sub>3</sub>N<sub>4</sub>, AlN and Si(Al)ON: synthesis, properties and prospects of a new class of (super)hard Materials**. **Dr. Y. Le Godec**, University Paris VI (France) presented **new methodologies for synthesis of bulk ultra-hard materials and some recent achievements**. **Prof. Dr. S. Porowski**, representative of Institute of High Pressure Physics (Poland) which is a consortium member of project START, presented **UNIPRESS – ISM (NASU) scientific cooperation prospects**. Another consortium partner CRISMAT-CNRS (France) was represented by **Prof. J. Noudem** who introduced **properties of bulk superconducting materials**. The topic **synthesis of MAX phases of Ti-Al-N system and MgB<sub>2</sub> in the wide range of pressures and temperatures**, was presented by **Prof. Dr. T. Prikhna**, ISM, (Ukraine). **Prof. Dr. L. Jaworska**, the Institute of Advanced Manufacturing Technology (Poland), presented **Properties of PCD materials with cobalt, MAX and borides bonding phases at elevated temperatures**. **Support mechanisms for innovation of the project «BILAT-Ukraine»** was presented by **Dr. M. Gorokhovatska**, Scientific Management Department, Presidium of the NASU (Ukraine). **I. Kulchytskyi**, Agency of European Innovations (Ukraine) introduced the **Post-project Exploitation Plan of the project START**. **Project proposals preparation for HORIZON-2020 program** was presented by **Dr. A. Bakowski**, Hi-Tech Consultants (Poland). Promising areas of joint scientific researches were presented on the next day of the conference on July 27. The second day of the conference started with the presentation of **Prof. Dr. T. Cabioch**, University of Poitiers (France) who introduced **CNRS-PPRIME - ISM (NASU) scientific cooperation prospects**. **Dr. M. Albrecht**, Institute of Crystal Growth (Germany) presented **Atomic Resolution Transmission Electron Microscopy Studies of III-Nitride Nanostructures**. **Prof. Wolfgang**



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Gawalek, IPHT and Magnetworld AG, Jena, Germany, made the presentation with the title «**Melt-textured YBCO for large-scale application**». Last but not least was the presentation of **Prof. Dr. V. Turkevych**, ISM (Ukraine) with the title «**Expansion of research subjects of ISM**».

The conference ended with an active discussion within the roundtable: New project proposals to the program "Horizon 2020"

In conclusion, the following are some conference moments in the photos.



Coordinators and organizers of the project START