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## ИНФОРМАЦИЯ

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### LASER TECHNOLOGY AT NEW STAGE OF DEVELOPMENT.

#### Third International conference

#### « Laser technologies in welding and materials processing, LTWMP-2007»

Conference was organized by the Paton Welding Institute (PWI) of the National Academy of Science of Ukraine and by the Laser Technology Research Institute (LTRI) of the National Technical University of Ukraine "KPI" and was held in Katsively town, Crimea, Black Sea coast, Ukraine on 29 May – 2 June 2007 (Chairmen – Prof. Borys Paton and Prof. Volodymyr Kovalenko).

At the 1st similar conference held in May 2003 the decision to arrange such conferences once per every 2 years was accepted. And thus again in 2005 the experts from 19 countries in the field of laser technology have presented the results of their last researches. For the third time now in 2007 the papers of authors from 18 different countries had been presented ((Ukraine, Russia, Belarus, Germany, Poland, PRC, France, Belgium, Slovenia, Iran, Turkey and others). It is nice that in spite of global overheating and hence terribly hot summer all around the world and especially in Ukraine we didn't lose many participants.

Conference started with short concert of violin orchestra of the State Crimean Engineering and Pedagogical University (rector – Prof. Fevzi Yakubov) headed by Zarema Alieva, the honored actress of Crimea. After that the welcome greetings to the participants from the Conference Co-Chairmen Prof. Borys Paton and Prof. Volodymyr Kovalenko had been pronounced.

The lasers have dynamically come practically to all spheres of human activity in last years. More than 350 various applications of lasers are known now. Use of lasers for processing materials in various industries is especially effective. The customer's interest to these technologies especially has increased for the last decades because of development of new generations of lasers with increased efficiency: solid-state, powerful CO<sub>2</sub>, excimer, metal vapor, compact diode, fiber optics etc.

Alongside with established topics this time the accent was made on rapidly developing new laser applications like those for medical and biological instrumentation, micro and nanoprocessing, sheet metal components shaping, etc.

Thanks to the latest global political and economic developments the enormous arm race has decreased drastically. So nowadays the civil applications of the newest scientific results has increased to great extent. And this is especially true for laser applications. The world is witnessing the wide spreading of lasers in medicine for the last few decades. The dynamic development and manufacturing of the large variety of lasers has greatly influenced that process. So the scientists are paying the great debt to mankind: after centuries of shortening the human beings life by creating new types of sophisticated weaponry the numerous researchers are taking the great efforts now to save the life of people and to prolong the human life expectancy. Thus the applications in medicine and related fields are occupying now the second position after industrial laser applications.

To this and to other last achievements in the field of laser technology in medicine the first program plenary report "Laser technology in medicine and medical instrumentation manufacturing" by Prof. V. Kovalenko LTRI of the NTUU, Ukraine) was devoted.

The large interest of the participants has caused the plenary paper by Prof. V. Golubev and colleagues (Institute of Laser and Information Technologies of RAS, Russia) "Deep penetration of high power CW CO<sub>2</sub> laser beam into liquid" and series of other papers devoted as usually to the deep study of different mechanisms of high power laser beam interaction with materials.

The report of Dr. E. Kreutz ( Fraunhofer Institut fuer Lasertechnik, Aachen, Germany) "Diagnosis and Modeling of Nonlinear Dynamics in Laser Cutting, Welding and Drilling" has demonstrated the whole range of opportunities to improve the quality and to increase the productivity at laser material processing. Another paper of the same author has caused the profound interest by proposing the reliable means of worn off turbine blades remanufacturing using laser technology.

Prof. Turichin (State Technical University of St.-Petersburg, Russia) devoted the paper of his group to the study of Peculiarity of Phase transformation Kinetics and Control of Material Microstructure Formation at Laser Hybrid Welding and to theoretical investigation of molten pool behavior at high speed deep penetration welding.

At the joint paper of experts from NTUU "KPI" and the Institute of Superhard Materials of NASU, Ukraine Prof. L. Golovko has described the new technology of laser sintering of tool composites containing diamonds. This topic had been developed further in poster papers of the experts participated in the project.

Slovenian researchers from Ljubljana University Prof. Govekar and Dr. R. Rozman were talking on modeling of plasma shielding phenomena and on progress in laser droplet formation and welding which was quite a new topic for laser community.

Large group of German researchers has brought their results at the conference. Thus U. Hoesslbarth (TRUMPF laser und Systemtechnik GmbH, Ditingen, Germany) described the application of laser systems, manufactured by this well known producer, in automotive manufacturing. B.Boese with colleagues (Laser Zentrum Hannover, Hannover Germany) presented results on hot cracks formation at welding of high alloy steels with pulsed laser beam. A. Florian (Bayerisches Laserzentrum gGmbH, Erlangen) was talking on "Laser based welding and Brazing in automotive production", M. Grden (BIAS-Bremen Institut fuer Angewandte Strahltechnik, Germany) presented the Paper "Fast Simulation of Thermal Bending Using Thermal and Mechanical Boundary Conditions.

In total the three plenary sessions were carried out.

The further work of a conference was held in form of oral sessions discussing different problems of welding, modeling, synthesis of three-dimensional objects, heat treatment, coating, equipment, other advanced processes (7 sessions). The special session was allocated to poster papers (27 in total).

Among session papers great attention was paid to various numerical methods of research, processes modeling, analysis of the physical phenomena at interaction of laser radiation with material. Thus the experts of the Bremen institute of beam technologies (Germany) and of LTRI (Ukraine) have presented the theoretical results of study of opportunities of use of laser radiation for programmed shaping of a sheet material. The analysis of existing models of the aerodynamic phenomena at gas-laser cutting of metals was presented in paper R. Zhuk and colleagues from LTRI (Ukraine).The researchers from PWI (Ukraine) Dr. I. Krivtsun and colleagues have considered the physical phenomena of interaction of laser radiation with materials at hybrid laser-plasma processing.

The hybrid laser processes are at the center of attention of many experts from the various countries. They allow essentially to raise the efficiency of laser processing, to improve its quality. The analysis of basic researches in the field of hybrid laser welding is made in the report of the Bremen experts (Germany), St. Petersburg Technical University(Russia) of PWI (Ukraine), of Laser Centre (Belgium) and others.

The tribology aspects of surfaces treated with laser radiation had been described in the paper of Dr. Pokhmurska and colleagues from University of Technology, Chemnitz, Germany and Karpenko Physico-Mechanical Institute NAS, Ukraine "Wear and Corrosion Properties of SiC Reinforced Surface Layers in Magnesium and Aluminium Alloys Obtained by Laser Melt Injection".

A number of reports was devoted to urgent problems of laser sintering of powder materials at realization of processes of synthesis 3D products (LTRI, Ukraine), (Concern of powder metallurgy, Minsk, Belarus) and others.

One of the report had been devoted to the problems of implementation of the results of fundamental and applied research into practice. This topic had been discussed in the presentation of experts from United Kingdom P. Curley (Imprimatur Capital Ltd., London, UK) and A. Petrivsky (Central and Eastern Europe Imprimatur Capital LTD., Kiev, Ukraine). Representatives of the company demonstrated the ways of financial support of advanced research which may be beneficial both for researchers and sponsors of the project.

The final report of the conference presented by V. Kolpakov (LTRI, Ukraine) concerned the opportunities for the efficiency increase of the sophisticated laser industrial systems by developing the corresponding WEB-network of available technologies and equipment in different regions and countries. The basic principles of work of the virtual enterprise using as industrial base the laser industrial equipment of various organizations for performance of the orders on laser processing with application of modern information systems and the Internet were shown. Except of the main principles it was disclosed as well that at this stage of development the work became already the international project integrating the efforts of experts from Ukraine, Slovenia, Lithuania and Hungary (collaborating in the framework of the bilateral research agreements between Ukraine and mentioned countries).

The conference has shown, that laser technology still remains the most dynamically developing area of science and engineering stably raising efficiency of existing processes of laser processing and constantly disclosing the new applications of lasers in different spheres. Among others the positive factor was the presence of young generation of researchers in laser technology sphere. Nevertheless the efforts has to be activated to attract more students, postgraduates, young researchers both from universities and industry.

The special role has to be marked of Dr. A. Zelnichenko and his team from the Organizing Committee who made the event quite successful and pleasant.

Friendly, hospitable and creative atmosphere of the conference promoted development of useful discussions, establishment of business contacts. The participants of the conference from different countries marking unconditional success of a conference, expressed wishes to take part in the next Forth International conference LTWMP-09 in 2009. Thus it became the traditional conference on laser technology in the post-soviet countries.

To conference opening the collection of papers abstracts and Program (in English) had been published. The complete conference Proceedings will be issued also in English at the end of November - beginning of December, 2007.

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