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INTERNATIONAL CONFERENCE ON BEAM TECHNOLOGIES



8th International Conference «Beam Technologies in Welding and Materials Processing» (BTWMP-2017) was held on September 11–15, 2017 at «Kurortny» boarding house in Odessa (Ukraine). It was organized by the E.O. Paton Electric Welding Institute of the NAS of Ukraine, Research Institute on

Laser Engineering and Technology of NTUU «Igor Sikorsky Kyiv Polytechnic Institute» and International Association «Welding».

50 scientists and specialists from Ukraine, Belarus, Poland, Iran, Canada participated in the Conference work as well as specialists from China with remote participation. The Conference was organized in a form of plenary and poster sessions. The working languages of the Conference were Russian, Ukrainian and English with simultaneous translation of the papers. 34 presentations were discussed in a course of plenary and poster sessions.

This year the format of the Conference was extended by initiative of Prof. I. Krivtsun, Conference Chairman, and presentations on electron beam technologies in welding and special electrometallurgy were included in the Conference program in addition to the traditional «laser» topics.

The Conference was opened by a review presentation of Prof. I. Krivtsun on «Hybrid laser-arc welding processes» (E.O. Paton Electric Welding Institute, Kyiv, Ukraine). The presentation indicated that application of hybrid technologies provides synergy effect, due to which usage of welding heat sources with relatively low power allows getting significantly higher penetration.

It is necessary to outline some presentations, which give an idea on the problems covered by the Conference:

- «Peculiarities of formation of magnesium alloy welded joints at pulse multilayer electron beam welding» *Nesterenkov V.M., Kravchuk L.A., Arkhangel'skiy Yu.A., Orsa Yu.V.* (E.O. Paton Electric Welding Institute of the NAS of Ukraine, Kyiv, Ukraine);

- «Efficiency of application of laser quenching of gear wheels for strength increase» *Devojno O.G., Kardapolova M.A., Avsievich A.M., Shvets I.V.* (Belarusian National Technical University, Minsk, Belarus);

- «Modelling of temperature fields for different types of 3D samples at their layer-by-layer formation

using electron beam welding equipment xBeam 3D Metal Printer» *Makhnenko O.V., Milenin A.S., Veliikoivanenko E.A., Rosynka G.F., Pivtorak N.I., Kozlitina S.S., Dzyubak L.I.* (E.O. Paton Electric Welding Institute of the NAS of Ukraine, Kyiv, Ukraine);

- «Effect of electron beam welding and local heat treatment on properties of welded joints of high-strength pseudo β -titanium alloy VT19» *Akhonin S.V., Belous V.Yu., Selin R.V., Vrzhyzhevsky E.L.* (E.O. Paton Electric Welding Institute of the NAS of Ukraine, Kyiv, Ukraine);

- «The new generation device for laser-microplasma (laser-plasma) welding» *Krivtsun I.¹, Korzhuk V.^{1,2}, Khaskin V.^{1,2}, Sydorets V.^{1,2}, Lou Z.³, Han S.³, Bushma A.¹, Dolyanovskaya O.¹* (¹E.O. Paton Electric Welding Institute of the NAS of Ukraine, Kyiv, Ukraine, ²China-Ukraine E.O. Paton Institute of Welding, Guangzhou, P.R. China, ³Guangdong Welding Institute, Guangzhou, P.R. China);

- «Structure and properties of welded joints produced by electron beam welding of boron-alloyed titanium» *Grigorenko S.G., Belous V.Yu.* (E.O. Paton Electric Welding Institute of the NAS of Ukraine, Kyiv, Ukraine);

- «Laser radiation welding in different spatial positions of circular joints of dissimilar steels» *Shelyagin V.D., Bernatsky A.V., Siora A.V., Shuba I.V., Kurilo V.A., Suchek V.M., Dakal V.A., Bondareva V.I., Bistriker F.E.* (E.O. Paton Electric Welding Institute of the NAS of Ukraine, Kyiv, Ukraine);

- «Increase of production efficiency of diamond coatings of abrasive tools using laser sintering» *Golovko L.F., Fadi Jaber* (NTUU «Igor Sikorsky Kyiv Polytechnic Institute», Kyiv, Ukraine);

- «Model of evaporation of multicomponent alloys in electron beam treatment» *Krivtsun I.V., Akhonin S.V., Berezos V.A., Severin A.Yu.* (E.O. Paton Electric Welding Institute of the NAS of Ukraine, Kyiv, Ukraine);

- «Possibilities of electron beam and laser welding over a layer of activating flux (A-EBW and A-LW processes)» *Kovalenko D.V., Abdulakh V.M.* (E.O. Paton Electric Welding Institute of the NAS of Ukraine, Kyiv, Ukraine);

- «New possibilities of additive manufacturing using xBeam 3D-Metal Printer technology» *Kovalchuk D.V., Melnik V.I., Melnik I.V., Tugaj B.A.* (SPE «Chervona Khvylya», Kyiv, Ukraine);

- «Restorative repairs of elements and assembly units of gas turbine engines» *Nesterenkov V.M.¹,*



Presentation of Prof. I. Krivtsun

Orsa Yu.V.¹, Khripko K.S.¹, Gusev Yu.V.² (E.O. Paton Electric Welding Institute of the NAS of Ukraine, Kyiv, Ukraine, ² LRF «Motor», Lutsk, Ukraine);

- «Development of gradient transition zones for protective EBPVD coatings» *Yakovchuk K.Yu., Rudoj Yu.E., Mikitchik A.V., Tkach R.A.* (SE «International Center of Electron Beam Technologies of E.O. Paton Electric Welding Institute of the NAS of Ukraine» Kyiv, Ukraine);

- «Innovative technologies and equipment for laser and hybrid welding processes of Guangdong Welding Institute» *Dong C.¹, Korzhyk V.², Khaskin V.², Sydorets V.², Lou Z.¹* (¹Guangdong Welding Institute, Guangzhou, P.R. China, ²China-Ukraine E.O. Paton Institute of Welding, Guangzhou, P.R. China);

- «Disperse and laminated volumetric nanocrystalline materials based on copper and molybdenum» *Grechanyuk N.I., Grechanyuk V.G.* (I. M. Frantsevich Institute of Problems of Materials Science of the NAS of Ukraine, Kyiv, Ukraine);

- «Production of ingots of intermetallic alloys in electron beam machines» *Akhonin S.V.¹, Severin A.Yu.¹, Berezos V.A.¹, Pikulin A.N.¹, Erokhin A.G.²* (E.O. Paton Electric Welding Institute of the NAS of Ukraine, Kyiv, Ukraine; ²SE «SPE «Titan» of E.O. Paton Electric Welding Institute of the NAS of Ukraine» Kyiv, Ukraine);

- «Distribution of alloying elements in welded joints of magnesium alloys, obtained by hybrid electron-beam technique» *Nesterenkov V.M.,*



During plenary session

Kravchuk L.A., Arkhangel'skiy Yu.A. (E.O. Paton Electric Welding Institute of the NAS of Ukraine, Kyiv, Ukraine);

- «Optimization of laser welding technology for multicomponent high-temperature alloys based on niobium» *Brodnikovskii M.P., Shelyagin V.D., Siora O.V., Shuba I.V.* (E.O. Paton Electric Welding Institute of the NAS of Ukraine, Kyiv, Ukraine);

- «Principles of obtaining aerospace industry and turbine construction products by rapid prototyping method with application of electron beam techniques» *Matviichuk V., Rusynyk M.* (E.O. Paton Electric Welding Institute of the NAS of Ukraine, Kyiv, Ukraine);

- «Electron beam fusion of ingots of high-strength $\alpha + \beta$ and pseudo β -titanium alloys» *Akhonin S.V.¹, Pikulin A.N.¹, Berezos V.A.¹, Severin A.Yu.¹, Erokhin A.G.²* (E.O. Paton Electric Welding Institute of the NAS of Ukraine, Kyiv, Ukraine; ²SE «SPE «Titan» of E.O. Paton Electric Welding Institute of the NAS of Ukraine» Kyiv, Ukraine);

- «Production of high-strength titanium alloys using electron beam melting method» *Akhonin S.V.¹, Berezos V.A.¹, Pikulin A.N.¹, Severin A.Yu.¹, Erokhin A.G.²* (E.O. Paton Electric Welding Institute of the NAS of Ukraine, Kyiv, Ukraine; ²SE «SPE «Titan» of E.O. Paton Electric Welding Institute of the NAS of Ukraine» Kyiv, Ukraine);

- «Role of structure in change of service properties of high-strength steel welded joints produced by laser and hybrid laser-arc welding» *Markashova L.I., Poznyakov V.D., Shelyagin V.D., Berdnikova E.N., Bernatsky A.V., Siora A.V., Alekseenko T.A., Polovetsky E.V.* (E.O. Paton Electric Welding Institute of the NAS of Ukraine, Kyiv, Ukraine);

- «Numerical prediction of deformations in spirally welded pipes using different welding techniques» *Kubiak M., Piekarska W., Saternus Z., Domański T.* (Institute of Mechanics and Machine Design Found-



Samples of products of SPE «Chervona Khvylya» Company



Participants of the Conference

dations, Czestochowa University of Technology, Czestochowa, Poland);

- «Study of properties of welded joint using DANTEC'S ISTR4 4D systems» *Domański T., Piekarska W., Kubiak M.* (Institute of Mechanics and Machine Design Foundations, Czestochowa University of Technology, Czestochowa, Poland).

There were also presentations on application of lasers in medicine. Out of the Conference program A.P. Mukhachev, Director of SSPE «Tsyronij» (1998–2003) provided the information on directions of enterprise activities in production of hafnium, zirconium, niobium and molybdenum using electron beam remelting machines. The representatives of a series of commercial Ukrainian enterprises also took part in the Conference without presentations.

A round-table discussion on «Perspectives of development and application of 3D beam technologies» was carried out at the end of the Conference. It was noted that up to the moment the largest amount of products is manufactured using classical technologies such as casting, welding, forging, stamping, mechanical treatment etc. At the same time, a new and completely original technology of 3D-printing and quick prototyping was proposed in the recent decades. Such technologies combine three main factors, i.e. material, energy (laser, electron beam, plasma flow etc.) and mathematical model of a future product. The round-table was also dedicated to discussion of the

relevant problems of development of beam technologies applicable to production of 3D products of different metallic materials, and SPE «Chervona Khvylya» showed the samples of the products made with 3D electron beam surfacing.

Proceedings of BTWMP-2017 will be published till the end of 2017. Proceedings of the previous LTWMP conferences — 2003, 2005, 2007, 2009, 2011, 2013 and 2015 can be ordered in the editorial office of «Avtomaticeskaya Svarka» journal or get in open access from the site of the E.O. Paton Electric Welding Institute publishing house by reference <http://paton-publishinghouse.com/eng/proceedings/ltwmp>.

Friendly, hospitable and creative atmosphere promoted development of useful discussions and arrangement of business contacts. The Conference participants unanimously agreed on proposal of performance of the next, 9th International Conference on Beam Technologies in Welding and Materials Processing (BTWMP-2019) in the middle of September 2019 in Odessa, Ukraine.

The Organizing Committee expresses thanks and gratitude to SPE «Titan» of E.O. Paton Electric Welding Institute and Center for Electron Beam Welding of E.O. Paton Electric Welding Institute for beneficent help provided in performance of the 8th International Conference «Beam Technologies in Welding and Materials Processing».

Dr. A.T. Zelnichenko, PWI

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