



## THIRTEENTH INTERNATIONAL CONFERENCE ON ELECTRON BEAM TECHNOLOGIES

18 – 22 June 2018

Varna, Bulgaria

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*The Conference is organized by*

**INSTITUTE OF ELECTRONICS BULGARIAN ACADEMY OF SCIENCES**

**THE TECHNOLOGICAL CENTER OF ELECTRON BEAM AND PLASMA  
TECHNOLOGIES, Sofia**

*In cooperation with*

**UNION OF ELECTRONICS, ELECTRICAL ENGINEERING AND TELECOMMUNI-  
CATIONS – Bulgaria**

## List of accepted abstracts for EBT 2018

<http://ebtconference.com/participants--abstracts.html>

### **I. Invited papers**

- **Synergetic aspects of thermal electron beam technologies**  
R. Zenker, A. Buchwalder  
*TU Bergakademie Freiberg, Institute of Materials Engineering; Zenker  
Consult, Germany*
- **Electron Beam Welding of Zircaloy-2 and Zircaloy-4 for Possible Application  
in Atomic Energy Sectors**  
Indranil Manna  
*Department of Metallurgical and Materials Engineering, Indian Institute of  
Technology Kharagpur, West Bengal, India.*
- **Electron beam assisted surface processing of materials**  
Jyotsna Dutta Majumdar  
*Department of Metallurgical and Materials Engineering, Indian Institute of  
Technology Kharagpur, India*



## List of accepted abstracts for EBT 2018

- **Effects of electron beam irradiation on properties of polymer films and liquid crystal**  
| Ulrich Maschke  
*Unité Matériaux et Transformations (UMET), Université Lille 1 - Sciences et Technologies, France.*
- **Limitations of electron beam lithography in the research and industry**  
| Ivan Kostic, Robert Andok, Vladislav Barak, Anna Bencurova, Adrian Ritomsky  
*Institute of Informatics, Slovak Academy of Sciences, Slovakia.*
- **Mathematical modeling for electron beam additive manufacturing**  
| Georgi Mladenov (1), Elena Koleva (1,2), Dmitriy Trushnikov (3)  
*(1) Institute of Electronics, Bulgarian Academy of Sciences, Sofia, Bulgaria*  
*(2) University of Chemical Technology and Metallurgy, Sofia, Bulgaria*  
*(3) Perm National Research Polytechnic University, Russian Federation*

## **II. Additive technology – 3D printing**

- **Enhanced process control during selective electron beam melting through advanced machine technology**  
| Christopher Arnold (1,2), Fuad Osmanlic (3), Christoph Pobel (3) and Carolin Körner (1,3)  
*(1) Friedrich-Alexander-Universität Erlangen-Nürnberg, Chair of Materials Science and Engineering for Metals, Erlangen, Germany*  
*(2) University of Erlangen-Nuremberg, Germany*  
*(3) Friedrich-Alexander-Universität Erlangen-Nürnberg, Joint Institute of Advanced Materials and Processes, Fürth, Germany*
- **Preliminary fabrication and characterization of electron beam melted Ti–6Al–4V customized dental implant**  
| Ravikumar Ramakrishnaiah, Abdulaziz Abdullah Al kheraif, Ashfaq Mohammad, Darshan Devang Divakar, Sunil Babu Kotha, Sree Lalita Celur, Mohamed I. Hashem, Pekka K. Vallittu, Intesham Ur Rehman  
*Dental Biomaterials Research Chair, Dental Health Department, College of Applied Medical Sciences, King Saud University, Riyadh, Saudi Arabia*
- **Application of additive electron-beam technologies for manufacture of metal products**  
| V.A. Matviichuk, V.M. Nesterenkov, M.O. Rusynik  
*E.O. Paton Electric Welding Institute of the NAS of Ukraine*



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- **Advanced technical and technological solutions for additive manufacturing by xBeam 3D metal printing**  
Dmytro Kovalchuk, Vitalii Melnyk, Ihor Melnyk, Borys Tugai  
*JSC NVO Chervona Hvilya, Kyiv, Ukraine*
- **Macroscopic simulation and experimental measurement of melt pool characteristics in selective electron beam melting of Ti-6Al-4V**  
Daniel Riedlbauer, Thorsten Scharowsky, Robert F. Singer, Paul Steinmann, Carolin Korner, Julia Mergheim  
*Applied Mechanics, Friedrich-Alexander-Universitat Erlangen-Nurnberg, Erlangen, Germany*
- **The approaches on secondary electron based online monitoring in EBSM process**  
Dechen Zhao (1,2,3), Feng Lin (1,2,3)  
*(1) Department of Mechanical Engineering, Tsinghua University, Beijing, China*  
*(2) Key Laboratory for Advanced Materials Processing Technology, Ministry of Education of China, China*  
*(3) Biomanufacturing and Rapid Forming Technology Key Laboratory of Beijing, China*
- **Electron beam additive manufacturing with wire**  
Węglowski M.St., Błacha S., Jachym R., Dutkiewicz J., Rogal Ł.  
*Institute of Welding, Gliwice, Poland*
- **The use of mathematical modeling for determining the control modes of electron-beam freeform fabrication**  
Alexey Shcherbakov, Daria Gaponova, Regina Rodyakina  
*Moscow Power Engineering Institute, Moscow, Russian Federation*
- **The development of laser-heated electron gun for additive manufacturing**  
Hongxin Li 1,2,3 \*, Feng Lin1,2,3,  
*(1) Department of Mechanical Engineering, Tsinghua University, Beijing 100084, China*  
*(2) Key Laboratory for Advanced Materials Processing Technology, Ministry of Education of China*  
*(3) Biomanufacturing and Rapid Forming Technology Key Laboratory of Beijing, China*

**III. Electron beam welding – technology and equipment**

- **EBW of aluminium alloys with application of electron beam oscillation**  
 | A. P. Sliva, V. K. Dragunov, E. V. Terentyev, A. L. Goncharov  
 | *Moscow Power Engineering Institute (MPEI), Russian Federation*
- **EBW technology of combined bandage of high-speed electric machine rotor**  
 | Dragunov V. K., Sliva A. P., Goncharov A. L., Portnov M. A., Terentyev  
 | E. V., Marchenkov A. Yu  
 | *Moscow Power Engineering Institute (MPEI), Russian Federation*
- **Technology of electron beam welding of pressure vessels made of steel 30KHGSA**  
 | Sliva A. P., Goncharov A. L., Dragunov V. K., Terentyev E. V.  
 | *Moscow Power Engineering Institute (MPEI), Russian Federation*
- **EBW of nuclear pressure vessel steel**  
 | B. Baufeld (1), J. Priest (1,2), T. Dutilleul (1)  
 | (1) *Nuclear AMRC, University of Sheffield, UK*  
 | (2) *Sheffield Hallam University, UK*
- **Mass production welding of die-cast aluminium alloys by electron beam**  
 | Daniel Drimal, Frantiek Kolenic, Lubos Kovac  
 | *PRVA ZVARACKA, Bratislava, Slovakia*
- **Optimization of EB keyhole welding of aluminum to titanium alloy**  
 | Petr Havlík, Jan Čupera, Jan Kouřil, Ivo Dlouhý, Rudolf Foret  
 | *Institute of Materials Science and Engineering, Faculty of Mechanical  
 | Engineering, Brno University of technology, Czech Republic*
- **Production weld quality assurance through monitoring of beam characteristics**  
 | Colin Ribton (1), Arben Ferhati (1), Nick Longfield (2), Phil Juffs (2)  
 | (1) *TWI Ltd., Cambridge, UK*  
 | (2) *Rolls Royce Ltd.*
- **Micro electron beam welding of the hybrid material combination Nitinol and stainless steel without filler material**  
 | Sebastian Hellberg (1), Sebastian Wagner (2), Dagmar Martin (2), Stefan  
 | Böhm (1), Hugo Hämmerle (2)  
 | (1) *Fachgebiet für Trennende und Fügende Fertigungsverfahren (tff),  
 | Universität Kassel, Germany*  
 | (2) *Naturwissenschaftliches-Medizinisches Institut der Universität Tübingen,  
 | Reutlingen, Germany*



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- **Dependency of the X-ray radiation on the welding channel placement the seam during the electron beam welding**  
V. Ya. Braverman, V. V. Bogdanov  
*Reshetnev Siberian State University of Science and Technology, Krasnoyarsk, Russia*
- **Comparison of electron beam and laser welding for safety critical space applications**  
Tim Mitchell (1), Andrew Norman (2)  
*(1) TWI Ltd., Cambridge, UK*  
*(2) ESA, UK*
- **Real time FPGA-based seam finder for EBW facility**  
M. M. Sizov, A. A. Starostenko, A. S. Tsygunov, A. M. Medvedev  
*Budker Institute of Nuclear Physics of Siberian Branch Russian Academy of Sciences (BINP SB RAS)*
- **Development of a miniature 3 axis magnetic field sensor to predict the magnetic stray field influence on electron beams**  
Peter Oving  
*TECHMETA – Bodycote, France*
- **Model for heating stainless steel by an electron beam**  
S. Plotnikov, R. Kimossov, A. Myakinin, A. Turlybekuly, N. Erdybaeva  
*East Kazakhstan State Technical University, Kazakhstan*
- **Computer simulation of an electron beam**  
N. Erdybaeva, S. Plotnikov, R. Kimossov, A. Myakinin, A. Turlybekuly  
*East Kazakhstan State Technical University, Kazakhstan*
- **The investigation of relationships between material's structure, crystallography and mechanical properties for some construction materials on the base of samples with circular stress point**  
Regina Rodyakina  
*Moscow Power Engineering Institute, Moscow, Russian Federation*
- **Experiments with EBW setup with possibility of right angle beam turn**  
O. N. Alyackrinskiy, M. Yu. Kosachev, P. V. Logatchov, A. M. Medvedev, Yu. I. Semenov, M. M. Sizov, A. A. Starostenko, A. S. Tsyganov  
*Budker Institute of Nuclear Physics of Siberian Branch Russian Academy of Sciences (BINP SB RAS)*



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- **Investigation of long-life cathode EB guns for welding of turbochargers**  
Sofia del Pozo (1) , Colin Ribton (1) , Bob Nicolson (2), Paul Plumb (2)  
(1) *Electron Beam Processes, TWI Ltd., Cambridge, UK*  
(2) *Cambridge Vacuum Engineering, Denny Industrial Centre. UK*
- **Some non-vacuum applications of guns with a plasma emitter**  
Sergey Kornilov (1), Nikolay Rempe (2)  
(1) *Advanced E-beam technology LLC, Tomsk, Russian Federation*  
(2) *Tomsk State University of Control System and Radioelectronics, Russian Federation*
- **The Green's function in thermal modelling of electron beam welding with various dynamic positioning of the beam**  
Tatyana V. Olshanskaya, Elena M. Fedoseeva  
*Perm National Research Polytechnic University, Russian Federation*
- **Thermal model in electron beam welding with various dynamic positioning of the beam**  
Tatyana V. Olshanskaya, Elena M. Fedoseeva  
*Perm National Research Polytechnic University, Russian Federation*
- **Empirical and thermal models for electron beam welding of steels**  
Tsvetomira Tsanevska (1), Elena Koleva (1,2), Georgi Mladenov (1)  
(1) *Institute of Electronics, Bulgarian Academy of Sciences, Sofia, Bulgaria*  
(2) *University of Chemical Technology and Metallurgy, Sofia, Bulgaria*
- **Software for control and management of electron beam movement**  
Elena Koleva (1,2), Kristian Cvetkov (1,2), Vladislav Gerasimov (1,2), Georgi Mladenov (1)  
(1) *Institute of Electronics, Bulgarian Academy of Sciences, Sofia, Bulgaria*  
(2) *University of Chemical Technology and Metallurgy, Sofia, Bulgaria*
- **Electron beam characteristics – measurement and evaluation**  
Elena Koleva (1,2), Georgi Mladenov (1)  
(1) *Institute of Electronics, Bulgarian Academy of Sciences, Sofia, Bulgaria*  
(2) *University of Chemical Technology and Metallurgy, Sofia, Bulgaria*
- **Electron beam welding simulation**  
Elena Koleva (1,2), Vladislav Gerasimov (1,2), Kristian Cvetkov (1,2), Tsvetomira Tsonevska (1), Georgi Mladenov (1)  
(1) *Institute of Electronics, Bulgarian Academy of Sciences, Sofia, Bulgaria*  
(2) *University of Chemical Technology and Metallurgy, Sofia, Bulgaria*



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- **The using of non-vacuum electron beam (NVEB) technology as a universal manufacturing process for welding and cutting of high-strength steel**

A. Beniyash, H.- J. Maier, G. Klimov, T. Hassel

*Institute of Materials Science, Leibniz University of Hannover, Germany*

### **IV. Electron beam melting. Electron beam and ion lithography**

- **Features of the New VON ARDENNE Beam Guidance System**

Udo Ließ, Jörg Faber, Matthias Neumann, Marko Plaschkies, Lars Ullmann

*VON ARDENNE GmbH, Dresden, Germany*

- **Trends in the production development of cobalt**

Valeriya Kovacheva-Ninova (1), Georgi Savov (2), Katia Vutova (3), Vania Vassileva (3), Evgeni Petrov (4), Dobrin Petrov (5)

*(1) University of Mining and Geology "St. Ivan Rilski", Sofia, Bulgaria*

*(2) Premiatec Ltd., Sofia, Bulgaria*

*(3) Institute of Electronics, Bulgarian Academy of Sciences*

*(4) COMETECH Ltd., Sofia, Bulgaria*

*(5) IPPK Ltd., Sofia, Bulgaria*

- **Development of silicon crystal growth technique from melt with electron beam heating**

A. Kravtsov (1), A. Krauze (2), J. Virbulis (2)

*(1) KEPP EU JSC, Riga, Latvia*

*(2) Center for Processes Analysis and Research Ltd, Riga, Latvia*

- **Effects of electron beam smelting on removal of inclusions in nickel-based superalloys**

Qifan You, Yi Tan, Longhai Zhao, Pengting Li, He Li, Huiping Liu, Jiayan Li

*School of Materials Science and Engineering, Dalian University of Technology, Dalian, China*

*Laboratory for New Energy Material Energetic Beam Metallurgical Equipment Engineering of Liaoning Province, Dalian, China*

- **35 years of the electron beam treatment on PODOLSK cable**

N. I. Gromov, M. N. Gromov, N. K. Kuksanov, R. A. Salimov, M. N. Stepanov

*JSC "PODOLSKCABEL", Russia*

- **Vistec Shaped Electron Beam Lithography**

Ines Stolberg, Hartmut Schacke

*Vistec Electron Beam, Germany*

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- **Modeling and optimization of the resist profiles obtained by electron beam lithography**

**Boriana Asparuhova (1), Elena Koleva (1,2), Ivan Kostic**

*(1) Institute of Electronics, Bulgarian Academy of Sciences, Sofia, Bulgaria*

*(2) University of Chemical Technology and Metallurgy, Sofia, Bulgaria*

*(3) Institute of Informatics, Slovak Academy of Sciences, Slovakia*

- **A multi column lithography system for low and medium volume mask manufacturing**

**Viacheslav V. Kazmiruk, Ilya G. Kurganov, Alexander A. Podkopaev,  
Tatiana N. Savitskaja**

*Institute of Microelectronics Technology and High Purity Materials, Russian Academy of Sciences (IMT RAS), Chernogolovka, Moskovskaya obl., Russian Federation*

### **V. Application of charged particles accelerators**

- **New multi cavity industrial electron accelerators ILU**

**Aleksandr Bryazgin**

*Budker Institute of Nuclear Physics, Novosibirsk, Russian Federation*

- **Depolymerization and self-disassembly of plant polymers**

**Alexander Ponomarev**

*Frumkin Institute of Physical Chemistry and Electrochemistry, Russian Academy of Sciences*

- **Current status of DC high power EB accelerators**

**Yury I. Golubenko, Nikolay K. Kuksanov, Rustam A. Salimov, Sergey N. Fadeev, Petr I. Nemytov, Alexey I. Korchagin, Alexandr V. Lavruchin, Alexey V. Semenov, Victor G. Cherepkov, Dmitry A. Kogut, Evgeny V. Domarov, Denis Vorobiev**

*Budker Institute of Nuclear Physics, Russian Federation*

- **Graphical user interface for investigation and optimization of electron beam induced grafting of starch**

**Mirela Braşoveanu (1), Lilyana Koleva (2), Monica R. Nemţanu (1), Elena Koleva (2,3), Toni Paneva (2)**

*(1) National Institute for Lasers, Plasma and Radiation Physics, Electron Accelerators Laboratory, Bucharest-Magurele, Romania*

*(2) University of Chemical Technology and Metallurgy, Sofia, Bulgaria*

*(3) Institute of Electronics, Bulgarian Academy of Sciences, Sofia, Bulgaria*



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- **Experimental design optimization and model prediction improvement by D-efficiency criterion for electron beam grafting of corn starch**

Lilyana Koleva (1), Elena Koleva (1,2), Toni Paneva (1), Mirela Braşoveanu (3), Monica R. Nemţanu (3)

(1) *University of Chemical Technology and Metallurgy, Sofia, Bulgaria*  
(2) *Institute of Electronics, Bulgarian Academy of Sciences, Sofia, Bulgaria*  
(3) *National Institute for Lasers, Plasma and Radiation Physics, Electron Accelerators Laboratory, Bucharest-Magurele, Romania*
- **Modelling of E-beam crosslinking of composite hydrogels**

Maria Demeter (1,2), Ion Călina (1,3), Cătălin Vancea (1,3), Toni Paneva (4), Elena Koleva (4,5), Lilyana Koleva (4)

(1) *National Institute for Lasers, Plasma and Radiation Physics, Electron Accelerators Laboratory, Bucharest-Magurele, Romania*  
(2) *University of Bucharest, Faculty of Chemistry, Bucharest, Romania*  
(3) *University of Bucharest, Faculty of Physics, Măgurele, Romania*  
(4) *University of Chemical Technology and Metallurgy, Sofia, Bulgaria*  
(5) *Institute of Electronics, Bulgarian Academy of Sciences, Sofia, Bulgaria*

## **VI. Electron, ion and plasma treatment of surfaces, hardening and coating. Automation of equipment and processes**

- **Influence of EB parameters on the time-temperature profile during EB hardening as single or combined surface treatment**

G. Grumbt, A. Buchwalder, A. Jung, P. Hengst, P. Hollmann, R. Zenker

*IWT, TU Bergakademie Freiberg, Germany*
- **Electron-beam modification of the Grade 2 titanium surface after ion-plasma nitriding**

A. Drobov, S. Yurevich, I. Pobol

*Physical-technical Institute of the national academy of sciences of Belarus  
Minsk, Belarus*
- **Improvement of the weld quality in friction stir welding of aluminium alloys by PVD coatings**

A. P. Ehasarian (1), A. Sugumaran (1), Y. Purandare (1), P. Eh. Hovsepian (1), P. Hatto (2), J. DeBacker (3)

(1) *Sheffield Hallam University, Sheffield, UK*  
(2) *Ionbond UK Ltd, Consett, Co. Durham, UK*  
(3) *TWI Technology Centre, Rotherham, UK*



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- **Structure formation of high-temperature alloy by plasma, laser and TIG surfacing**  
Krivonosova E. A., Schitsin Yu. D., Trushnikov D. N., Myshkina A., Akulova S.N., Neulibin S.D., Dushina A.A.  
*Perm National Research Polytechnic University, Russia*
- **Preliminary simulation of Magnetron sputtering using Pegasus software**  
Hitoshi Suizu, Ryota Matsuda, Tomonori Tabe, Hiroshi Toyota, Takeshi Tanaka  
*Department of Electronics and Computer Engineering – Hiroshima Institute of Technology, Japan*
- **Contact characteristic for Iridium-coated Probe**  
Koichi Miyazono (1), Toshitaka Yorita (1), Masayuki Yamauchi (2), Kenta Fukutomi (2), Tomonori Tabe (2), Hitoshi Suizu (2), Ryota Matsuda (2), Yoshihiro Masui (2), Hiroshi Toyota (2), Masaki Koike (2), Takeshi Tanaka (2)  
*(1) MIURA CORPORATION,*  
*(2) Department of Electronics and Computer Engineering – Hiroshima Institute of Technology, Japan*
- **A Fano cavity test for electron transport algorithms of EGSnrc, PENELOPE, MCNP6 and Geant4 codes in a magnetic field**  
Jaegi Lee (1), Jimin Lee (1), Dongmin Ryu (1), Hochan Lee (2) and Sung-Joon Ye (1,3)  
*(1) Program in Biomedical Radiation Sciences, Department of Transdisciplinary Studies, Graduate School of Convergence Science and Technology, Seoul National University, Seoul, Republic of Korea*  
*(2) Department of Physics, Ajou University, Suwon, Republic of Korea*  
*(3) Biomedical Research Institute, Seoul National University Hospital, Seoul, Republic of Korea*
- **Experimental study on the sterilization of food with the self-igniting plasma formed from liquid using plasma-based ion implantation**  
Koji Kakugawa (1), Manami Hosotani (1), Miyo Arikado (1), Tomonori Tabe (2), Kenta Fukutomi (2), Yoshinobu Tsuchiya (1) and Takeshi Tanaka (2)  
*(1) Department of Food Science and Biotechnology, Faculty of Life Sciences, Hiroshima Institute of Technology, Hiroshima, Japan*  
*(2) Department of Electronics and Computer Engineering, Faculty of Engineering, Hiroshima Institute of Technology, Japan*



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- **The optimum condition on the sterilization of *Geobacillus stearothermophilus* spores using plasma-based ion implantation**

Motoko Hiyama (1), Koji Kakugawa (1), Aya Yakushiji (1), Kenichi Watanabe (2), Ryota Matsuda (2), Yoshinobu Tsuchiya (1) and Takeshi Tanaka (2)

(1) *Department of Food Science and Biotechnology, Faculty of Life Sciences, Hiroshima Institute of Technology, Hiroshima, Japan*

(2) *Department of Electronics and Computer Engineering, Faculty of Engineering, Hiroshima Institute of Technology, Japan*
- **Applied voltage dependence of plasma characteristic for food sterilization using PBII method**

Kenichi Watanabe, Ryota Matsuda, Tomonori Tabe, Motoko Hiyama, Kento Sakasegawa, Yuuta Yamamoto, Koji Kakugawa, Takeshi Tanaka

(1) *Department of Food Science and Biotechnology, Faculty of Life Sciences, Hiroshima Institute of Technology, Hiroshima, Japan*

(2) *Department of Electronics and Computer Engineering, Faculty of Engineering, Hiroshima Institute of Technology, Japan*
- **Dispersed and layered volumetric nanocrystalline materials based on copper and molybdenum condensed from the vapor phase**

Nicolai Hrechaniuk (1), Vera Hrechaniuk (2), Olena Khomenko (1), Dmytro Kovalchuk (3)

(1) *Frantsevich Institute of Problems of Materials Science, National Academy of Sciences, Ukraine*

(2) *Kiev National university of building and architecture of managing department of chemistry, Ukraine*

(3) *JSC NVO Chervona Hvilya, Kyiv, Ukraine*
- **Construction of a preliminary file backup system for surface analysis data using secret sharing technique**

Nobuharu Okamitsu (1), Tomonori Tabe (1), Ryota Matsuda (1), Noriyuki Yamada (2), Toyoharu Takemoto (3), Takeshi Tanaka (1)

(1) *Department of Electronics and Computer Engineering – Hiroshima Institute of Technology, the Japan*

(2) *Innovation Firm co., Ltd,*

(3) *MIURA CORPORATION*
- **Electron-ion-plasma equipment for surface modification of materials**

A. D. Teresov, N. N. Koval, Yu. F. Ivanov, V. N. Devyatkov, V. V. Shugurov

*Institute of high current electronics SB RAS, Tomsk, Russia*



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- **Possible applications of the electron source with a wide-mesh plasma cathode and the output beam into the atmosphere**  
M. S. Vorobev, N. N. Koval  
*Institute of High Current Electronics SB RAS, Tomsk, Russian Federation*
- **Resent developments and potential applications of fore-vacuum plasma cathode electron sources**  
Efim Oks  
*Tomsk State University of Control Systems and Radioelectronics, Tomsk, Russian Federation*
- **Development and application of a toroidal EB source for non-thermal electron treatment of bulk goods**  
Goesta Mattausch, Ignacio Gabriel Vicente-Gabas, Ralf Bluethner, Andre Weidauer  
*FEP - Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology, Dresden, Germany*
- **Modeling of the physical mechanical properties of steel 316 after EB treatment**  
Elena Koleva (1,2), Volodia Djarov (1), Vania Vassileva (1), Rozina Yordanova (2), Svetla Yankova (2)  
*(1) Institute of Electronics, Bulgarian Academy of Sciences, Sofia, Bulgaria*  
*(2) University of Chemical Technology and Metallurgy, Sofia, Bulgaria*
- **Using Bremsstrahlung X-Ray for positioning of filled wire during electron beam surfacing**  
Stepan Varushkin, Dmitriy Trushnikov  
*Perm National Research Polytechnic University, Russian Federation*
- **Plasma parameter control using Penning effect in plasma-based ion implantation**  
Matsuda Ryota (1), Yuto Kijima (1), Koji Kakugawa (1), Hiroshi Toyota (1), Takeshi Tanaka (1), Katia Vutova (2)  
*(1) Hiroshima Institute of Technology, Japan*  
*(2) Institute of Electronics, Bulgarian Academy of Sciences, Sofia, Bulgaria*
- **Fabrication of high performance carbon nanotube cold cathode electron beam (C-beam) for various devices**  
Kyu Chang Park, Jung Su Kang Sung Tae Yoo  
*Department of Information Display and Advanced Display Research Institute, Kyung Hee University, Seoul, Korea*
- **Towards autonomous hardware and software in data base management systems**  
K. Schwertner  
*Sofia University, Bulgaria*



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