

EDITORIAL BOARD

Editor-in-Chief

B.E. Paton

Scientists of PWI, Kiev

S.I. Kuchuk-Yatsenko (vice-chief ed.),

V.N. Lipodaev (vice-chief ed.),

Yu.S. Borisov, G.M. Grigorenko,

A.T. Zelnichenko, V.V. Knysh,

I.V. Krivtsun, Yu.N. Lankin,

L.M. Lobanov, V.D. Poznyakov,

I.A. Ryabtsev, V.F. Khorunov,

K.A. Yushchenko

Scientists of Ukrainian Universities

M.N. Brykov, ZNTSU, Zaporozhie

V.V. Dmitrik, NTU «KhPI», Kharkov

V.V. Kvasnitsky, NSU, Nikolaev

V.D. Kuznetsov, NTUU «KPI», Kiev

Foreign Scientists

N.P. Alyoshin

N.E. Bauman MSTU, Moscow, Russia

Guan Qiao

Beijing Aeronautical Institute, China

A.S. Zubchenko

DB «Gidropress», Podolsk, Russia

M. Zinigrad

College of Judea & Samaria, Ariel, Israel

V.I. Lysak

Volgograd STU, Russia

Ya. Pilarczyk

Welding Institute, Gliwice, Poland

U. Reisgen

Welding and Joining Institute, Aachen, Germany

O.I. Steklov

Welding Society, Moscow, Russia

G.A. Turichin

St. Petersburg SPU, Russia

Founders

E.O. Paton Electric Welding Institute, NASU

International Association «Welding»

Publisher

International Association «Welding»

Translators

A.A. Fomin, O.S. Kurochko, I.N. Kutianova

Editor

N.A. Dmitrieva

Electron galley

D.I. Sereda, T.Yu. Snegiryova

Address

E.O. Paton Electric Welding Institute,

International Association «Welding»

11 Kazimir Malevich Str. (former Bozhenko Str.),

03680, Kiev, Ukraine

Tel.: (38044) 200 60 16, 200 82 77

Fax: (38044) 200 82 77, 200 81 45

E-mail: journal@paton.kiev.ua

www.patonpublishinghouse.com

State Registration Certificate

KV 4790 of 09.01.2001

ISSN 0957-798X

Subscriptions

\$348, 12 issues per year,

air postage and packaging included.

Back issues available.

All rights reserved.

This publication and each of the articles contained  
herein are protected by copyright.

Permission to reproduce material contained in this  
journal must be obtained in writing from the Publisher.

CONTENTS

SCIENTIFIC AND TECHNICAL

<i>Ignatov A.V., Krivtsun I.V. and Semenov I.L.</i> Characteristics of non-equilibrium arc plasma in plasmatron nozzle channel .....	2
<i>Golovko V.V. and Taraborkin L.A.</i> Modelling of chemical composition of weld pool metal in arc methods of welding .....	12
<i>Marchenko A.E.</i> Rheological investigations of non-isothermal pressure flows of coating mixtures for welding electrodes .....	17
<i>Kotelchuk A.S.</i> Influence of thermophysical properties of cores of self-shielding flux-cored wires on welding and technological properties .....	30
<i>Paltsevich A.P.</i> Investigation of conditions for providing low content of diffusion hydrogen in welding using electrodes of basic type .....	35

INDUSTRIAL

<i>Akhonin S.V., Belous V.Yu., Petrichenko I.K. and Selin R.V.</i> Influence of filler metal on structure and properties of welded joints of high-strength two-phase titanium alloys produced using argon arc welding .....	39
<i>Yuan Hong, Zhang Guo-Dong, Wang Jin-Xue, Yu Huai and Zhu Zhi-Shou.</i> Electron beam weldability of damage-tolerant titanium alloy TC21 .....	44
<i>Gubunya I.P. and Yavdoshchin I.R.</i> Mechanisms of formation of welding aerosol solid component and paths of its penetration into the living organism (Review) .....	49

INFORMATION

Visit of delegation of Poland Institute of Welding to the E.O. Paton Electric Welding Institute .....	52
---	----

## VISIT OF DELEGATION OF POLAND INSTITUTE OF WELDING TO THE E.O. PATON ELECTRIC WELDING INSTITUTE

Delegation of Poland Institute of Welding (Instytut Spawalnictwa in Gliwice) consisting of A. Pietras, Director of the Institute, and E. Turyk, Deputy of Head of Welding Technology Department, visited the PWI in the period of November 18–20, 2015 on invitation of the Board of Directors. Aim of the visit was familiarization of management of Poland Institute of Welding with the directions of the PWI activities.

Several meetings were held in accordance with visit program.

Head of «Investigation of physical processes, technology and equipment for electron beam and laser welding» Department V.M. Nesterenkov, Corr. Member of the NASU, presented for Poland colleagues the directions of Department activity on manufacture of EBW equipment and developments of new EBW technologies; new 40 m<sup>3</sup> chamber for EBW and unique 100 m<sup>3</sup> chamber for EBW of new chambers were demonstrated. It was a presentation of technological operations on manufacture of all-welded outer part of body of front medium pressure chamber in gas turbine engine from casting titanium  $\alpha$ -alloy VT5L, consisting of pillars and blades, using

EBW method with computer-regulated technological process.

V.M. Lobanov, PWI Deputy Director, Academician of the NASU, highlighted the main directions of PWI activity in the field of welded structures optimizing as well as non-destructive testing and technical diagnostics of welded parts and structures. He also informed Poland colleagues on development of complex program of the NASU «Resource» directed on extension of safe life of the structures, constructions and machines. At the end, Prof. Lobanov arranged an excursion for the guests to PWI show-room.

In course of the meeting I.V. Krivtsun, PWI Deputy Director, Academician of the NASU, pointed out the issues of modelling of physical processes taking place in welding. The possibilities of increase of efficiency of hybrid processes of welding based on laser irradiation energy were discussed.

One more meeting was held with the Head of Department «Physical-chemical investigations of materials» G.M. Grigorenko, Academician of the NASU, during which it was possible to familiarize with different types of analytical equipment, in particular,



During signing of Agreement on cooperation (from left to right: L.M. Lobanov, B.E. Paton, A.T. Zelnichenko and A. Pietras)



Discussion of possibilities of tool for high-frequency mechanical peening (from left to right: E. Turyk, A. Pietras and V.V. Knysh)

Gleeble 380 (DSI) unit, optical spectrometer (ICP-Spectrometer) with inductively coupled plasma iCAP 6500 DUO (Thermo Fisher Scientific), Auger-microprobe with field emission cathode JAMP-9500F (JEOL).

Head of Department «Special high-voltage equipment and laser welding» Dr. V.D. Shelyagin presented the guests with Department capabilities in the field of laser welding technologies, in particular, provided detailed description of manual laser tool, developed in PWI, for welding in railway transport.

PWI unique equipment for mechanical tests, including press MP-800 and tool for high-frequency mechanical peening of welded joints, was demonstrated in «Strength of welded structures» Department (Head — Prof. V.V. Knysh).

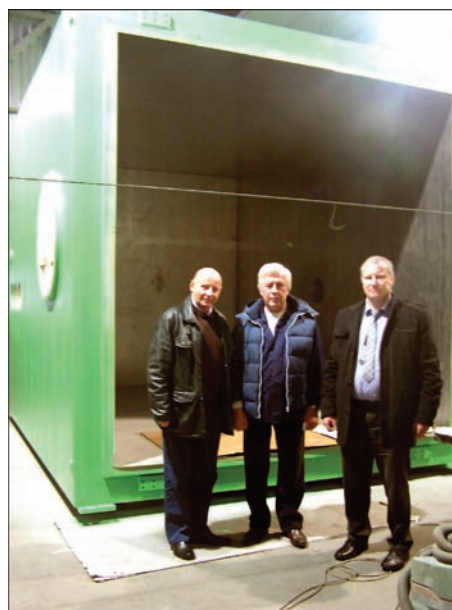
Also, a meeting was held with Head of Department of V.N. Bakul Institute for Superhard Materials A.L. Majstrenko, Corr. Member of the NASU. The issues related with improvement of friction stir welding technology and manufacture of specialized instruments were discussed in the course of meeting.

Director of the International Association «Welding» Dr. A.T. Zelnichenko familiarized Poland guests with the main directions of the PWI publishing activity and Conference plans for 2016, which are organized by PWI.

The final meeting with PWI Director, Academician Boris E. Paton took place on November 20. It covered



In show-room of PWI (from left to right: L.M. Lobanov, E. Turyk and A. Pietras)



Against electron beam chamber (from left to right: E. Turyk, V.M. Nesterenkov and A. Pietras)

the issues of cooperation between the Institutes. Poland experience on training of welders was discussed in details. The final point of the meeting was signing of Agreement on scientific-and-technical cooperation between the E.O. Paton Electric Welding Institute and Poland Institute of Welding.

*Dr. A.T. Zelnichenko, PWI*



# PATON PUBLISHING HOUSE

www.patonpublishinghouse.com

## SUBSCRIPTION

**The Paton**  
**WELDING JOURNAL**

**АВТОМАТИЧЕСКАЯ  
СВАРКА**

«The Paton Welding Journal» is Published Monthly Since 2000 in English, ISSN 0957-798X.

«Avtomaticheskaya Svarka» Journal (Automatic Welding) is Published Monthly Since 1948 in Russian, ISSN 005-111X.

«The Paton Welding Journal» is Cover-to-Cover Translation of Avtomaticheskaya Svarka» Journal into English.

If You are interested in making subscription directly via Editorial Board, fill, please, the coupon and send application by Fax or E-mail.

The cost of annual subscription via Editorial Board is \$348 for «The Paton Welding Journal» and \$180 for «Avtomaticheskaya Svarka» Journal.

«The Paton Welding Journal» can be also subscribed worldwide from catalogues subscription agency EBSO.

### SUBSCRIPTION COUPON

Address for journal delivery

Term of subscription since

20

till

20

Name, initials

Affiliation

Position

Tel., Fax, E-mail

We offer the subscription all issues of the Journal in pdf format, starting from 2009.

The archives for 2009–2014 are free of charge on [www.patonpublishinghouse.com](http://www.patonpublishinghouse.com) site.



## ADVERTISEMENT

in «Avtomaticheskaya Svarka» and «The Paton Welding Journal»

### External cover, fully-colored:

First page of cover  
(190×190 mm) — \$700  
Second page of cover  
(200×290 mm) — \$550  
Third page of cover  
(200×290 mm) — \$500  
Fourth page of cover  
(200×290 mm) — \$600

### Internal cover, fully-colored:

First/second/third/fourth page  
of cover (200×290 mm) — \$400

### Internal insert:

Fully-colored (200×290 mm) —  
\$340

Fully-colored (double page A3)  
(400×290 mm) — \$500

- Article in the form of advertising is 50 % of the cost of advertising area
- When the sum of advertising contracts exceeds \$1001, a flexible system of discounts is envisaged

**Size of journal after cutting is  
200×290 mm**

### Editorial Board of Journal «Avtomaticheskaya Svarka» and «The Paton Welding Journal»

E.O. Paton Electric Welding Institute of the NAS of Ukraine

International Association «Welding»

11 Kazimir Malevich Str. (former Bozhenko Str.), 03680, Kiev, Ukraine

Tel.: (38044) 200 60 16, 200 82 77; Fax: (38044) 200 82 77, 200 81 45

E-mail: [journal@paton.kiev.ua](mailto:journal@paton.kiev.ua); [www.patonpublishinghouse.com](http://www.patonpublishinghouse.com)