

# Guest Editorial

## Special Issue on Vacuum Discharge Plasmas (ISDEIV—PS) - 2015

**I**N THE Special Issue, we are proud to present the expanded versions of selected papers presented at the 26th International Symposium on Discharges and Electrical Insulation in Vacuum (ISDEIV). It was held at Nehru Centre, Worli, Mumbai, India, from September 28 to October 3, 2014.

The International Symposia on Discharge and Electrical Insulation in Vacuum (ISDEIV) is a non-profit, international organization whose purpose is to encourage the advancement of the science and application of electrical insulation and discharges in vacuum, primarily by conducting symposia for the exchange of scientific information. The symposia are held biannually (even-numbered years). The symposia are interdisciplinary meetings for the exchange of results, presentation of progress, and discussion of ideas and challenges for the future in the field of electrical discharges and insulation in vacuum. Both fundamental and applied aspects are covered. Symposia program consists of invited talks, invited oral contributions, and posters. Minicourses and informal discussions on relevant topics may also be offered in addition to the regular Symposium schedule.

The ISDEIV have a long tradition, from 1964 until now. The 26th ISDEIV was attended by 250 delegates and accompanying persons from 14 countries. The local committee organized the symposium into a format that allowed in-depth topical discussions, which included nearly 188 oral presentations in plenary and in poster sessions. Manuscripts of works that were presented at ISDEIV are published in the ISDEIV 2014 Proceedings grouped according to scientific areas. Peer-reviewed expanded manuscripts are also published at the IEEE TRANSACTIONS ON PLASMA SCIENCE AND IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION as special issues.

The scientific program of the Symposium included the following topics of discussion in the conference:

- 1) vacuum breakdown and pre-breakdown phenomena;
- 2) surface discharges and flashover phenomena;
- 3) RF breakdown and multipactoring phenomena;
- 4) high-field effects in microelectromechanical systems and nano-structures;
- 5) switching in vacuum and related phenomena;
- 6) interaction of vacuum arc with magnetic field;
- 7) vacuum arc physics;
- 8) computer modeling and computer-aided design;

- 9) pulse power physics and technology;
- 10) vacuum interrupters and their applications;
- 11) deposition of coatings by vacuum arc plasmas and related technologies;
- 12) electron, ion, neutron, X-ray, and other beam and light sources;
- 13) accelerators and fusion reactor-related issues;
- 14) space-related technologies;
- 15) vacuum arc melting and degassing.

These topics were grouped into the following three main subject areas: 1) breakdown and flashover; 2) vacuum arc; and 3) applications.

The DEIV Symposia are operated under the direction of the Permanent International Scientific Committee (PISC), whose current Chairman is Dr. Lesli T. Falingham (U.K.). The Local Organizing Committee facilitates the meetings. More details on the ISDEIV and the PISC can be found at the ISDEIV Web site (<http://isdeiv.lbl.gov/>).

Three awards were granted at the symposium. The Dyke Award, which was endowed by the Toshiba Corporation, was awarded to Dr. Andre Anders, who presented the lecture “Ion energies in vacuum arcs: A critical review of data and theories leading to traveling potential humps.” The recipient of the Chatterton Award (for Outstanding Achievement of Young Investigator in the Field of Discharge and Electrical Insulation in Vacuum), which was provided by ABB Calor-Emag Schaltanlagen AG, became Dr. Yuki Inada from the University of Tokyo, Japan, for the paper “Simultaneous Measurement of Two-Dimensional Electron and Vapour Density Distribution over Vacuum Arc.” Also The Best Paper Award—Japan Prize was presented to Yingyao Zhang, Xiaofei Yao, Zhiyuan Liu, Yingsan Geng, and Ping Liu for their contribution “Axial Magnetic Field Strength Needed for a 126-kV Single-Break Vacuum Circuit Breaker During Asymmetrical Current Switching.”

The review process of the Special Issue was managed by the Senior Editor and two Guest Editors, who are technically knowledgeable in one or more specializations and are experienced in the publication process. This editorial process worked smoothly. The two Guest Editors have split their obligations to lead the review process for 50 submitted manuscripts. Nineteen of them were rejected due to low reviewer scores. In the current Special Issue of the IEEE TRANSACTIONS ON PLASMA SCIENCE, we present 19 contributed papers, which could be grouped into three general categories: 1) plasma arc breakdown and flashover in vacuum; 2) vacuum arc plasmas;

and 3) applications of vacuum discharge plasmas. Additional papers from the symposium are to be published in a special issue of the IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION.

We would like to thank Dr. Steven Gitomer, Editor-in-Chief, and Dr. Kenneth Struve, Senior Editor, for providing us the opportunity to put together this Special Issue and their excellent support for making it a reality. Finally, we appreciate all the authors who submitted papers for this issue (including those whose papers we were unable to include) and to the reviewers, without whose help, it would not have been possible. We truly believe that the published material will be interesting to scientists and engineers working in the fields of vacuum discharge physics and technology. As always,

we continue to hope that this Special Issue will inspire others to join the ever-growing community of researchers.

ALEXANDER BATRAKOV, *Guest Editor*  
Laboratory of Vacuum Electronics @ Institute of  
High Current Electronics SB RAS  
Tomsk 636055, Russia

VASILY KOZHEVNIKOV, *Guest Editor*  
Department of Plasma Physics  
Faculty of Physics  
Tomsk State University  
Tomsk 636050, Russia



**Alexander Batrakov** was born in Tomsk, Russia, in 1963. He received the M.S. degree in plasma physics from Tomsk State University, Tomsk, in 1984, and the Ph.D. degree in physics and mathematics from the Institute of High-Current Electronics (IHCE), Tomsk, in 1997.

He has been with IHCE, Russian Academy of Sciences, since 1984. His current research interests include physics of prebreakdown phenomena in vacuum, vacuum breakdown, and vacuum discharge.



**Vasily Kozhevnikov** (M'13–SM'13) was born in Tomsk, Russia, in 1980. He received the B.S., M.S., and Ph.D. degrees in theoretical physics from Tomsk State University, Tomsk, in 2002, 2004, and 2008, respectively.

He has been an Associate Professor with the Department of General and Experimental Physics, Faculty of Physics, Tomsk State University, since 2009. Since 2014, he has also been a Research Associate with the Laboratory of Low-Temperature Plasma, Tomsk State University. He has authored over 40 articles. His current research interests include low-temperature plasma and gas discharge physics, computational electrodynamics, wideband nanosecond radiolocation, physical kinetics, and microwave techniques.