2010 Annual Report Conference on Electrical Insulation and Dielectric Phenomena

(CEIDP 2010)

West Lafayette, Indiana, USA
17 – 20 October 2010

Volume 1
Pages 1-344
## Contents

### Volume 1

**Whitehead Lecture**

1. **Whitehead Lecture - Bringing an Insulation to Failure: The Role of Space Charge**
   
   Gian Carlo Montanari

   1-1 **Novel Surface Potential Decay of TiO₂-Based Polyimide Nanocomposite Films**
   
   Junwei Zha, George Chen, Yuan Zhuang and Zhimin Dang

   1-2 **Hydrothermal Aging of XLPE/Silica Nanocomposites**
   
   Le Hui, J. Keith Nelson and Linda Schadler

   1-3 **Electrical Properties of Nano-Modified Insulating Vegetable Oil**
   
   Zhaotao Zhang, Jian Li, Pin Zou and Stanislaw Grzybowski

   1-4 **Investigation Regarding Corona Free Endwinding Design of Form Wound High Voltage Stator Windings**
   
   Markus Lerchbacher, Denis Imamovic, Gerhard Lemesch, Franz Ramsauer and Michael Muhr

   1-5 **Classification of Acoustic Emission Based Partial Discharge in Oil Pressboard Insulation System Using Fractal Features**
   
   Prasanta Kundu, N. K. Kishore and A. K. Sinha

   1-6 **Effects of Ionic Carriers on the Morphological Properties of Electrospun Nanofibres**
   
   Chitral Angammana and Shesha Jayaram

   1-7 **Dielectric Properties High Performance Fibers**
   
   Eric David, Carlos Arrieta, Patricia Dolez, Toan Vu-Khanh, Hugues Couderc and Michel Fréchette

**Session 2A (Poster) Ageing and Charge**

2A-1 **Surface Ageing of Dielectric Materials in a Controlled Atmosphere: A Raman Microprobe Study**

   Nicola Freebody and Alun Vaughan

2A-2 **The AC Aging Characteristics of High Voltage Gradient ZnO Varistors Doped with Different Content of Bi₂O₃**

   Jun Liu, Jinliang He, Jun Hu, Wangcheng Long and Fengchao Luo

2A-3 **Parameters Affecting the Electrical and Thermal Properties of Transformer Oils**

   Janvier Sylvestre N’Cho, Luc Loiselle, Issouf Fofana, Abderrahmane Beroual and Thomas Aka-Ngou
2A-4 Simulation of Breakdown in Small Confined Volumes Inside Dielectrics for Electrical Ageing and Diagnostic

Igor Pashinin, Sergey Pancheshnyi, Severine LeRoy and Lanne Pitchford

2A-5 Influence of Moisture on the Electrical Properties of XLPE Insulation

Yacine Mecheri, Mohammed Nedjar, Alain Lamure, M. Aufray and C. Drouet

2A-6 Effect of Moisture on Breakdown Voltage of Polyesterimide Used in Electrical Machines

M. Nedjar, Y. Mecheri, A. Lamure, M. Aufray and C. Drouet

2A-7 Degradation Properties of the Epoxy Nanocomposite Caused by a Gamma-Ray Irradiation

Ki Yup Kim, Don Sun Im, Jae Hak Choi and Kyoung Yong Lee

2A-8 Towards Real-Time Life Estimation of Capacitors Subjected to Time-Varying Temperature

Andrea Albertini, Maria Gabriella Masi, Giovanni Mazzanti, Lorenzo Peretto and Roberto Tinarelli

2A-9 The Effect of Thermal Ageing on the Rheological, Thermal and Electrical Properties of Poly(Ethylene Oxide)

Martin Reading and Alun Vaughan

2A-10 A New Test Method for Assessing the Impact of Thermal Cycling on Hydrogenerator Stator Insulation

Thomas Brugger

2A-11 Early Stage Detection of Insulating Oil Decaying

Issouf Fofana, Abdelghafour Bouaicha, Yazid Hadjadj, Janvier Sylvestre N’Cho, Thomas Aka-Ngnui and Abderrahmane Beroual

2A-12 The Assessment of Oil-Paper Insulation Condition Based on Frequency Response Method

Jun Liu, Guang-Ning Wu, Wei Lv, Li-Jun Zhou and Ying-Jie Min

2A-13 Electric Field Analysis of High Voltage Apparatus Using Finite Element Method

Chao Zhang, Jeffrey Kester, Charles Daley and Stephen Rigby

2A-14 Electrical Properties Calculation of HVDC Bushing

Xiaolin Chen, Peter H.F. Morshuis, Johan J. Smit, Gwénaël Marquezin and Alain Girodet

2A-15 Analysis of Electric Field Inside HV Substations Using Charge Simulation Method in Three Dimensional

Essam Shalan, Samy Ghania and Sayed Ward

Session 2B (Poster) Charge Storage and Transport

2B-1 Influence of Absorbed Moisture on the Dielectric Properties of Epoxy Resins

Stephen Dodd, Nikola Chalashkanov, Len Dissado and John Fothergill
| 2B-2 | Electrical Characteristics of Double Layer Capacitor Mixing Ketjenblack with Surface Functional Group | Daisuke Tashima, Yusuke Betsumiya, Hiromu Yoshitama, Masahisa Otsubo, Seiji Maeno and Yoshinobu Nagasawa | 117 |
| 2B-3 | Numerical Analysis of Electric Fields in Composite Oil/Cellulose Insulation | Ola Widlund and Tor Laneryd | 121 |
| 2B-4 | Space Charge Accumulation and Conductivity of Crosslinking Byproducts Soaked LDPE | Nuriziani Hussin and George Chen | 125 |
| 2B-5 | Comparison Between the Electroluminescence and Space Charge of Ultraviolet and Thermally Aged Low Density Polyethylene | David H Mills, Paul L Lewin and George Chen | 129 |
| 2B-6 | The Influence of Iodine Impurity States on Dielectric Properties of Polyethylene | Ahmed Huzayyin, Steven Boggs and Ramamurthy Ramprasad | 133 |
| 2B-7 | Analysis of Electric Double Layer in Aqueous Solutions of Sodium Chloride | Yohei Fujiii, Yuji Muramoto and Noriyuki Shimizu | 137 |
| 2B-8 | Electronic Properties of TiO₂ Thin Films Under UV Light Irradiation | Yusuke Watanabe, Yuji Muramoto and Noriyuki Shimizu | 141 |
| 2B-9 | Dielectric Characteristic Evaluation of Proton Beam Irradiated Polyimide Films | Seiya Numata, Hiroaki Miyake, Yasuhiro Tanaka and Tatsuo Takada | 145 |
| 2B-10 | Charge Injection and Extraction in Metal/Polyethylene Contact Through an Exponential Distribution of Surface States | Mandana Taleb, Gilbert Teyssedre, Séverine LeRoy and Christian Laurent | 149 |
| 2B-11 | Template-Based Fluoropolymer Ferroelectrets with Multiple Layers of Tubular Channels | Ruy Alberto Pisani Altafini, Xunlin Qiu, Werner Wirges, Heitor Cury Basso, Ruy Alberto Correa Altafini, Reimund Gerhard, Dante Luis Chinaglia, Werner Jenninger and Joachim Wagner | 153 |
| 2B-12 | Behavior of Glass Containing Alkali Ions Under E-Irradiation | S.Fakhfakh, Z. Fakhfakh and O. Jbara | 157 |
| 2B-13 | Charge Measurement in Electron Irradiated Ceramic MgO: Induced Current and Mirror Effect Methods | Nouha Ghorbel and Ali Kallel | 161 |
| 2B-14 | A Discussion on the Likely Mechanisms for Dielectric Charging in AFM | Kremena Makasheva, Bernard Despax, Laurent Boudou, Christian Laurent and Gilbert Teyssedre | 165 |
2B-15 Space Charge Characterisation in Nano-Dielectric by the Thermel Step Method

Belgaroui Ezzeddine and Kallel Ali

Session 3A (Poster) Outdoor Insulation

3A-1 Polymer Concrete Outdoor Insulation – Experience from Laboratory and Demonstrator Testing

Lars E. Schmidt, Andrej Krivda, Chau Hon Ho and Mauricio Portaluppi

3A-2 The Radial Distribution of Temperature in XLPE Cable: An Analysis with the Finite Volume Numerical Method (FVM)

Larbi Boukezzi, Youcef Saadi and Ahmed Boubakeur

3A-3 Experience with Non Ceramic Bushings and Current Transformers in Substations

Isaias Ramirez and Rodolfo Garcia

3A-4 Ice Accretion on Different Aluminum Cable Steel Reinforced

Fochi Wang, Yuzhen Lv, Qing Zhang and Chengrong Li

3A-5 The Influence of Surface Ageing Features of Insulators on Wet Flashover Performance

Antonios Tzimas, Simon Rowland and James Barrett

3A-6 Investigation of Hydrophobic Pollution Layers on Silicone Rubber Outdoor Insulation

Henrik Hillborg, Andrej Krivda, Lars E. Schmidt and Xavier Kornmann

3A-7 Accelerated Aging Methods for Outdoor Insulation -- Rotating Wheel and Salt Fog Chamber Tests

Stephen Sebo and Xin (Carol) Liu

3A-8 Tracking and Erosion Resistance of Silicone Rubber Nanocomposites Under Positive and Negative DC Voltages.

Joseph Vimal Vas, B. Venkatesulu and M. Joy Thomas

3A-9 A Study on the Shed Design of DC Composite Insulator Under Contamination Flashover

Jian Li, Fuzeng Zhang, Zhicheng Guan and Liming Wang

3A-10 Anti-Icing Performance of RTV Coating with Different Resistivity on Insulators

Zhihai Xu, Zhidong Jia, Zhicheng Guan, Liming Wang, Robing Zhang, Yuming Zhao and Yan Li

3A-11 Influence of Sugar as Contaminant on Outdoor Insulation Characteristics of RTV Coating Insulators

Hongwei Mei, Yingke Mao, Liming Wang and Zhicheng Guan

3A-12 A New Optimization Method on Electric Field Distribution of Composite Insulators

Yang Qing, Sima Wenzia, Deng Jiazhuo, Yuan Tao and Chen Lin
3A-13 Silicone Rubber Compositions with Yttrium-Doped Ceramics for Outdoor Insulation ..........222
   M. Paredes-Olguín, C. Gómez-Yáñez, F.P. Espino-Cortés

3A-14 Frequency Analysis of the Leakage Current Under Non Uniform Polluted Conditions on One
   Insulator Plane Model ..............................................................................................................226
   Mohammed Adnane Douar, Abdelouahab Mekhaldi and Mohamed Chérif Bouzdidi

3A-15 Use of Electrospinning to Disperse Nanosilica Into Silicone Rubber.................................230
   Shanshan Bian, Shesha Jayaram and Edward A. Cherney

Session 3B (Poster) Measurement Techniques

3B-1 Probe for Measurements of the DC Electric Field in Air Around High Voltage Apparatus.......234
   Kenneth Johansson, Lars Walfridsson, Uno Gåfvert, Birgitta Källstrand and Sven Hörfeldt

3B-2 Injecting Charges on Large-Area Electret Thin Film by Corona Multi-Pin Discharge Method ...238
   Yu-Hao Su, Cheng-En Chung, Wen-Ching Ko, Chih-Hsiang Yang and Chih-Kung Lee

3B-3 Impact of Oil and Temperature on Initial Voltage Distributions ........................................242
   Marek Florkowski, Barbara Florkowska, Jakub Furga and Piotr Pajak

3B-4 Estimation of Radiated High Frequency Magnetic and Electric Fields in a 245kV GIS ..........246
   J. V. G. Rama Rao, J. Amarnath and S. Kamakshaiah

3B-5 Accurate Modelling of Very Fast Transient Overvoltages in a 245kV GIS and Research on
   Protection Measures..................................................................................................................250
   J. V. G. Rama Rao, J. Amarnath and S. Kamakshaiah

3B-6 The High Frequency Characteristic of Wideband Rogowski Coil with Asymmetric Windings...254
   Yangchun Cheng, Yinghui Yan and Chengrong Li

3B-7 Internal Overvoltages in Transformer Windings in Frequency Domain.................................258
   Marek Florkowski, Marek Fulczyk, Jakub Furgal, Magdalena Ostrogórska and Wojciech Piascecki

3B-8 Measurement Based Fault Location in Three-Terminal Overhead Line and Underground
   Cable .........................................................................................................................................262
   Marek Fulczyk, Przemysław Balcerek, Eugeniusz Rosolowski, Jan Izykowski and Murari M. Saha

3B-9 Development of a New Technique for the Study of a Single Trap in Insulators for Electronic
   Components ...............................................................................................................................266
   Milos Chvatal, Martin Kopecky, Vlasta Sedlakova and Jan Pavelka

3B-10 Measurement Technique for Electromagnetic Field Intensity Distribution Using Infrared 2-D
   Lock-In Amplifier .......................................................................................................................270
   Noritaka Chiyo, Mizuki Arai, Yasuhiro Tanaka, Atsuhiro Nishikata, Takuichi Hirano and
   Takashi Maeno
3B-11 Optical Measurement of Ice Load on Transmission Lines................................. 274
Guo-Ming Ma, Cheng-Rong Li, Jian Jiang, Ying-Ting Luo and Yang-Chun Cheng

3B-12 Development of Sensor Scanning Type Space Charge Measurement System........ 278
Masumi Fukuma, Naoya Masuda and Kaori Fukunaga

3B-13 A Deconvolution Technique for Space Charge Recovery in Lossy and Dispersive Dielectrics
Using PEA Method........................................................................................................... 282
Bertrand Vissouvanadin, Christian Laurent , Séverine LeRoy, Gilbert Teyssedre, Isabelle Denizet,
Mohamed Mammeri and Bernard Poisson

3B-14 A Fundamental Study of Acoustic Waves Propagation Inside a PEA Cell in Order to Improve the
Condition Number of Transfer Function Matrix............................................................... 286
Mohamad Arnaout, Fulbert Baudoin, Laurent Berquez and Denis Payan

3B-15 On-Line Monitoring System for Capacitive Traction Power Equipment of High-Speed
Railway .................................................................................................................................. 290
L.J. Zhou, G.N. Wu and J. Liu

Session 3C (Poster) Various

3C-1 Properties of Creeping Discharge Progressed in Narrow Gap Between Two Solid Dielectrics in
PFAE Oil............................................................................................................................... 293
T. Usui, R. Hanaoka, N. Osawa, S. Takata, Y. Kanamaru and H. Koide

3C-2 Dissipation Current Waveforms Monitoring in LDPE Sheet Under Water Tree Deterioration Test
(Part 2). ................................................................................................................................ 297
Kazuyuki Tohyama, Taku Osada, Tomoaki Imai and Kazutoshi Abe

3C-3 Temperature Characteristics of Water Tree Propagation in a Wide Temperature Range Using
XLPE Sheets .......................................................................................................................... 301
Jun Ogiwara, Koji Yonaha, Hiroaki Uehara and Katsutoshi Kudo

3C-4 The Partial Discharge Phenomena on the Surface of Oil Impregnated Paper with Parallel Electric
Field ....................................................................................................................................... 305
Yangchun Cheng, Ernst Gockenbach, Christian Eichler and Chengrong Li

3C-5 The Influence of Interfaces and Channels on Electrical Tree Growth in Epoxy Resin........... 309
Sanjay Bahadoorsingh, Riccardo Guissani and Simon Rowland

3C-6 Influence of Transverse Electric Fields on Electrical Tree Initiation in Solid Insulation ........ 313
Mohammed Talaat

3C-7 Dependence of Electrical Treeing Behavior on Cross-Linking Temperature of XLPE ............. 317
Boxue Du, Tao Han, Yu Gao, Zongle Ma and Xiaohui Zhu
3C-8 Breakdown Properties of Epoxy Nanodielectric ................................................................. 321
Enis Tuncer, Claudia Cantoni, Karen More, D. Randy James, Georgios Polizos, Isidor Sauers and Alvin R. Ellis

3C-9 Liquid Nitrogen Breakdown Due to Thermally Generated Bubbles in Plane-Plane Electrode Geometry ......................................................................................................................................... 325
Isidor Sauers, Randy James, Alvin Ellis, Enis Tuncer, Georgios Polizos and Marshall Pace

3C-10 Design of Liquid-Nitrogen-Insulated Apparatus Through Unified Breakdown Field Data Having Different Area and Volume Effects ...................................................................................... 329
Marshall Pace, Isidor Sauers, Randy James, Enis Tuncer and Georgios Polizos

3C-11 Influence of Residual Conductivity on the Stability Threshold of a Dielectric Liquid Surface Under Electric Field and Charge Injection .................................................................................. 333
Rafael Chicón, Alberto Pérez and Francisco Pontiga

3C-12 Electrical Characteristics of Environmental-Friendly Oils ...................................................................................... 337
Satoshi Arazoe, Daisuke Saruhasi, Yuki Sato, Satoru Yanabu, Shigemitsu Okabe and Genyo Ueta

3C-13 Possible Mechanism of Electrical Treeing and Breakdown for Polyimide Nanocomposite Film Used in Inverter-Fed Motor ........................................................................................................ 341
Yi Cui, Guangning Wu, Chao Wu and Yang Luo

Volume 2
Session 4 (Oral) General II

4-1 The Breakdown Threshold of Dielectric Barrier Discharges in Piezoelectric Polymer Foams .... 345
Scott Harris, Olena Mellinger and Axel Mellinger

4-2 State-Space Embedding as a Visualization Method for Mixed Partial Discharge Activities ....... 349
Tadeusz Czaszejko and Roger Schurch

4-3 Contribution to the Modelling of Electroluminescence in High Voltage Polymeric Materials .... 353
Fulbert Baudoin, David H. Mills, Paul Lewin, Sérène LeRoy, Gilbert Teyseddre and Christian Laurent

4-4 Effect of Mechanical Stress on Fast Pulse-Like Conduction in XLPE Based Materials .......... 357
Davide Fabiani, Gian Carlo Montanari and Leonard Dissado

4-5 Breakdown Characteristics in Oil/pressboard-Composite Insulation System at HVDC Polarity Reversal ........................................................................................................................................... 361
Hitoshi Okubo, Tsutomu Nara, Hikaru Saito, Hiroki Kojima, Naoki Hayakawa and Katsumi Kato

4-6 Viability of Cancerous Cell Lines as a Function of Energy Delivered ...................................... 365
Session 5 (Poster) 5A Pre-Breakdown and Breakdown In Solids, Liquids, Gases, and Vacuum

5A-1 Influence of Air Pressure on Positive DC Corona Inception Voltage of Stranded Conductors in the Corona Cage
Xiaobo Meng, Xingming Bian, Fenglin Chen, Yingjian Yang, Liming Wang and Zhicheng Guan

5A-2 Effect of Bi2O3 Doping on the Electrical Characteristics of Al-Doped ZnO Varistors with Low Residual Voltage
Wangcheng Long, Jinliang He, Jun Hu and Jun Liu

5A-3 Effect of Absolute Humidity on Disruptive Discharge Voltage of Standard Sphere Air Gaps
Yukio Mizuno, Masafumi Masuda, Osamu Fujii and Katsuhiko Naito

5A-4 Specimen Development for Evaluating Electrical Properties and Study of Breakdown Mechanism on Extremely Thin PEN Film
Shinya Torimoto, Sadanori Koike, Yoshinobu Murakami and Masayuki Nagao

5A-5 Corona Pulse Rise Time Measurements Between Point Plane Electrodes in Atmospheric Air
B.R. Natarajan, G.R. Gurumurthy and J. Amarnath

5A-6 The Influence of Insulation Wrapping on HV Electrode on the Dynamics of Electrical Discharges in Transformer Oil
Pawel Rozga

5A-7 Effect of Nano-Fillers on Electrical Breakdown Behavior of Epoxy Resin
Qi Wang, Peter Curtis and George Chen

5A-8 Physico-Chemical Modeling of Positive Corona Discharge in Carbon Dioxide
Khelifa Yanallah, Francisco Pontiga, Helena Moreno and Antonio Castellanos

5A-9 A New Type of Controllable Multi-Spark Gap with High Reliability Applied in High Voltage Grid
Lingdong Xie, Jianchao Zheng, Yuming Zhao, Jisan Yang, Jinwei Chu, ZhiCheng Guan and Liming Wang

5A-10 A Comparison of Breakdown Properties at High Voltage Between Natural and Synthetic Esters
Minh Nguyen Ngoc, Olivier Lesaint, Nelly Bonifaci, André Denat and Mehrdad Hassanzadeh

5A-11 Computer Simulation of a Negative Streamer in Uniform Electric Field
Andrey Samusenko, Dmitry Sokolov and Yury Stishkov

5A-12 Breakdown of Ar+SF6 Under AC Electric Fields
H.R. Hiziroglu and M.S. Dincer
<table>
<thead>
<tr>
<th>Session 5 (Poster) 5B Partial Discharge Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>5B-1 Knowledge Discovery from On-Line Cable Condition Monitoring Systems</td>
</tr>
<tr>
<td>Xiaodi Song, Chengke Zhou, Donald Hepburn and Xiaosheng Peng</td>
</tr>
<tr>
<td>5B-2 Denoising and Feature Extraction in On-Line PD Based Cable Condition Monitoring Systems</td>
</tr>
<tr>
<td>Xiaosheng Peng, Chengke Zhou, Donald Hepburn and Xiaodi Song</td>
</tr>
<tr>
<td>5B-3 Modelling of Partial Discharge Behaviour in a Spherical Cavity Within a Solid Dielectric Material as a Function of Temperature</td>
</tr>
<tr>
<td>Hazlee Illias, George Chen and Paul Lewin</td>
</tr>
<tr>
<td>5B-4 Partial Discharge Initiated by Grounding Metallic Protrusion in GIS: Light and Electromagnetic Emission Phenomena and Discharge Evolution Process</td>
</tr>
<tr>
<td>Bo Qi, Zhyguo Tang, Cheng Rong Li, Bibo Geng and Hao Zhen</td>
</tr>
<tr>
<td>5B-5 The Influence of PWM Stresses on Degradation Processes</td>
</tr>
<tr>
<td>Barbara Florkowska, Marek Florkowski, Józef Roehrich and Pawe Zydroń</td>
</tr>
<tr>
<td>5B-6 Location of Partial Discharge at Joint Section of XLPE Cable Using Acoustic Emission Technique</td>
</tr>
<tr>
<td>Jannus M. Nainggolan, Toshihiko Nakashima, Tatsuya Sakoda, Masahisa Otsubo, Satoshi Kurihara, Shinya Nagasato and Takayoshi Yarimitsu</td>
</tr>
<tr>
<td>5B-7 Evaluation of Partial Discharge Under Inverter Surge Application Using Current Waveform</td>
</tr>
<tr>
<td>Takahiro Takino, Yoshinobu Murakami, Naohiro Hozumi and Masayuki Nagao</td>
</tr>
<tr>
<td>5B-8 Partial Discharge Inception Voltage for Magnet Wire of Inverter-Fed Motors Under Surge Voltage Application</td>
</tr>
<tr>
<td>Naoki Hayakawa, Fuminobu Shimizu, Xie Peng and Hitoshi Okubo</td>
</tr>
<tr>
<td>5B-9 Influence of the Rise Time and of the Temperature on PD Inception Voltage of Enameled Wires</td>
</tr>
<tr>
<td>Francesco Guastavino, Gabriele Cotella, Andrea Dardano, Guido Fulvio Massa, Alessandro Ratto, Stefano Squarcia and Eugenia Torello</td>
</tr>
<tr>
<td>5B-10 Performance of the Support Vector Machine Partial Discharge Classification Method to Noise Contamination Using Phase Synchronous Measurements</td>
</tr>
<tr>
<td>Demetres Evagorou, Andreas Kyprianou, George Georgiou, Jack Hunter, Liwei Hao and Paul Lewin</td>
</tr>
</tbody>
</table>
5B-11 Application of Capacitor Sensor in PD Detection at the Three-Phase Cross-Bonding Link-System of XLPE Cable
Wei Wang, Chong Liu, Zan Wang, ChaoFei Gao and Heng Sui

5B-12 Experimental Study on the Development Characteristics of Point Discharge in GIS
Wang Caixiong, Tang Zhiguo, Chang Wenzhi, Li Chengrong, and Zheng Shusheng

5B-13 Development and Application of Data Analysis Software for Transformers PD UWB RF Location

5B-14 Inception of Partial Discharges Under Repetitive Square Voltages: The Effect of Voltage Waveform and Repetition Rate on PDIV and RPDIV
Andrea Cavallini, Elisabeth Lindell, Gian Carlo Montanari and Marco Tozzi

5B-15 Properties and Gas Production Law of Surface Discharge in Transformer Oil-Paper Insulation
Xi Chen, Weigen Chen and Degang Gan

5B-16 Partial Discharge Analysis of a Narrow Dielectric Gap with Repetitive Half-Sine Pulses
Xiaolei Wang, Respicius Clemence and Hans Edin

5B-17 Corona in Oil as a Function of Geometry, Temperature and Humidity
Mohamad Ghaffarian Niasar and Hans Edin

5B-18 Round-Robin Test on Repetitive PD Inception Voltage of Twisted-Pairs
Ken Kimura, Masayuki Hikita, Naoki Hayakawa, Masayoshi Nagata, Kazunori Kadowaki and Yoshinobu Murakami

Session 6 Prebreakdown and Breakdown In Solids, Liquids, Gases, and Vacuum (Oral)

6-1 Simulation on Surge Responses of ZnO Varistors by Voronoi Network with Actual Grain Boundary Model
Jun Hu, Wangcheng Long, Jinliang He and Jun Liu

6-2 Fabrication Technique of Permittivity Graded Materials Using Particle Movement Simulation
Junki Shimomura, Yuuki Fujii, Naoki Hayakawa, Masahiro Hanai and Hitoshi Okubo

6-3 High Energy Density Polymer Composites for Pulse Power Applications
Shiva Balasubramanian, Yogesh Anguchamy, Peter Mazykov, Hans-Conrad zur Loye, Tangali Sudarshan and Harry Ploehn

6-4 The Application of the Enlargement Law to HVDC Cable Lines
Massimo Marzinotto and Giovanni Mazzanti
6-5 Breakdown Behavior of Insulating Gases for HVDC Applications - Imamovic .................................. 510
Denis Imamovic and Michael Muhr

6-6 Geometry Impact on Streamer Propagation in Transformer Insulation Liquids ......................... 514
Rongsheng Liu, Crister Törnkvist, Vijaya Chandramouli, Orlando Girlanda and Leif A. A. Pettersson

Session 7 (Poster) 7A Nanodielectrics

7A-1 Generic PD Resistance Characteristics of Polymer Nanocomposites ....................................... 518
Toshikatsu Tanaka and Tomonori Iizuka

7A-2 Dielectric Spectroscopy of Epoxy-Based Nanodielectrics with Metal Oxide Fillers .................. 522
R. R. Patel and Nandini Gupta

7A-3 On the Use of Raman and FTIR Spectroscopy for the Analysis of Silica-Based Nanofillers ...... 526
Celia Yeung, Gabriele Gherbaz and Alun Vaughan

7A-4 Short Term DC Breakdown and Complex Permittivity of Al₂O₃- And MgO-Epoxy Nanocomposites ......................................................................................................................... 530
Thomas Andritsch, Roman Kochetov, Peter Morshuis and Johan Smit

7A-5 Effect of Filler Size on Complex Permittivity and Thermal Conductivity of Epoxy-Based Composites Filled with BN Particles .................................................................................. 534
Roman Kochetov, Thomas Andritsch, Peter H.F. Morshuis and Johan J. Smit

7A-6 Dielectric Response and Thermal Conductivity of Epoxy Resin Filled with Nanoalumina Particles of Different Size in α, γ and δ Phase ........................................................................... 538
Roman Kochetov, Thomas Andritsch, Peter H.F. Morshuis and Johan J. Smit

7A-7 DC Conduction in Epoxy Based Nano- And Mesocomposites .................................................. 542
Thomas Andritsch, Roman Kochetov, Peter Morshuis and Johan Smit

7A-8 Preparation and Breakdown Strength of TiO₂ Fluids Based on Transformer Oil ..................... 546
Yu-Zhen Lv, Xiao-Xin Li, Yue-Fan Du, Fo-Chi Wang and Cheng-Rong Li

7A-9 Thermo-Mechanical and Electrical Characterization of Epoxy/Nanoclay Composites .......... 549
Francesco Guastavino, Gianfranco Coletti, Andrea Dardano, Alberto Fina and Abdul Salam Thelakkadan

7A-10 Short-Medium Term Behaviour of Polypropylene and Its Nanocomposites .......................... 553
Francesco Guastavino, Gianfranco Coletti, Alessandro Ratto, Stefano Squarcia and Eugenia Torello

7A-11 Space Charge Formation and Conduction Current of MgO/LDPE Nanocomosite ................. 556
Yoshinobu Murakami, Takayuki Okazaki, Masayuki Nagao, Yoitsu Sekiguchi, Chakradhar Reddy and Yoshinao Murata
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>7A-12</td>
<td>Space Charge Evolution in Polypropylene Containing Synthetic and Natural Organoclays</td>
<td>Mahmoud Abou-Dakka, Alexander Bulinski and Soli Bamji</td>
</tr>
<tr>
<td>7A-14</td>
<td>AC Breakdown Characteristics of Epoxy Alumina Nanocomposites</td>
<td>P. Preetha and M. Joy Thomas</td>
</tr>
<tr>
<td>7A-15</td>
<td>Influence of Dispersed Nanoparticle Content on Dielectric Property in Epoxy/Alumina Nanocomposites</td>
<td>Naoki Hayakawa, Muneaki Kurimoto, Yuuki Fujii, Junki Shimomura, Masahiro Hanai, Yoshikazu Hoshina, Masafumi Takei and Hitoshi Okubo</td>
</tr>
<tr>
<td>7A-16</td>
<td>Study of Ice Accumulation on Nanocomposite Semiconducting Coatings</td>
<td>Gelareh Momen and Masoud Farzaneh</td>
</tr>
<tr>
<td>7A-17</td>
<td>Space Charge Properties of LDPE Influenced by Heat Treatments</td>
<td>Lijun Yang, Huazhong Zhang, Jian Li, Caixin Sun and Ruijin Liao</td>
</tr>
<tr>
<td>7A-18</td>
<td>Space Charge Measurements on Polymer Nanocomposite HDPE/SiO₂ Materials</td>
<td>Jerome Castellon, Laurent Banet, Ioana Preda, Serge Agnel, Alain Tourellie, Michel Fréchette, Eric David and Abdelkhalek Sami</td>
</tr>
<tr>
<td>7A-19</td>
<td>Dielectric Properties Modeling of High and Low Density Polyethylene/SiO₂ Composites</td>
<td>Abdelkhalek Sami, Eric David and Michel Fréchette</td>
</tr>
<tr>
<td>7A-20</td>
<td>Procedure for Evaluating the Crystallinity from X-Ray Diffraction Scans of High and Low Density Polyethylene/SiO₂ Composites</td>
<td>Abdelkhalek Sami, Eric David and Michel Fréchette</td>
</tr>
<tr>
<td>7A-21</td>
<td>Progress with the Engineered Self-Assembly of Polymer Nanodielectrics</td>
<td>Clive Reed</td>
</tr>
<tr>
<td>7A-23</td>
<td>Breakdown Properties in Transformer Oil-Based TiO₂ Nanofluid</td>
<td>Du Yue-fan, Lv Yu-zhen, Zhou Jian-Quan, Li Xiao-Xin and Li Cheng-Rong</td>
</tr>
</tbody>
</table>
### Session 7 (Poster) 7B Various

<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>7B-1</td>
<td>Nanosecond, Low Volatge Electro-Endocrine-Therapy for Breast Cancer Treatment</td>
<td>Funian Xiao, James Leary, Lisa Reece, Ignacio Camarillo, Madhivanan Sundararajan and Raji Sundararajan</td>
</tr>
<tr>
<td>7B-2</td>
<td>Influence of D.C. Electric Field on Growth of Arabidopsis Thaliana (Thale-Cress)</td>
<td>Takamaş Okumura, Yuji Muramoto and Noriyuki Shimizu</td>
</tr>
<tr>
<td>7B-3</td>
<td>Electric Field Distribution of Human Breast Tissue</td>
<td>Poornima Agoramurthy and Raji Sundararajan</td>
</tr>
<tr>
<td>7B-4</td>
<td>Efficiency of Several Pulsed Discharge Types to Degrade Organic Pollutants in Water</td>
<td>Thu Huyen Dang, Olivier Lesaint and André Denat</td>
</tr>
<tr>
<td>7B-5</td>
<td>Electric Field Analysis in Tumor Tissues</td>
<td>V. Gowri Sree, N.A. Nandhini, K. Udayakumar and R. Sundararajan</td>
</tr>
<tr>
<td>7B-6</td>
<td>An Experimental Study of NOx Removal Treatment on Multiple Photochemical Reaction with Vacuum-Ultra-Violet Light Irradiation</td>
<td>Takahiro Nakayama and Ryu-ichiro Ohyama</td>
</tr>
<tr>
<td>7B-7</td>
<td>An Experimental Study for Application of a Gas-Stream Atmospheric Pressure Plasma Device to Surface Modifications</td>
<td>Ryuta Inazuka, Masanobu Yamazaki, Ryo Arai and Ryu-Ichiro Ohyama</td>
</tr>
<tr>
<td>7B-8</td>
<td>Distribution of Discharge Current in Stratified Seawater Under Impulse Discharges</td>
<td>Nur Shahida Binti Midi and Ryu-ichiro Ohyama</td>
</tr>
<tr>
<td>7B-9</td>
<td>Charge Simulation Modeling for Calculation of Electrically Induced Human Body Currents</td>
<td>Mohammed Talaat</td>
</tr>
<tr>
<td>7B-10</td>
<td>Dynamics of Metallic Particle Contamination in a Gas Insulated Bus Duct with SF₆ and N₂ Gas Mixtures</td>
<td>M. Raghavendra Rao and J. Amarnath</td>
</tr>
<tr>
<td>7B-11</td>
<td>Experimental Investigation on Dielectric Spectroscopy of Insulating Paper and Oil</td>
<td>Xiaolin Chen, Peter H.F. Morshuis, Barry Lennon and Johan J. Smit</td>
</tr>
<tr>
<td>7B-12</td>
<td>Broad Band Dielectric Investigation of Cross-Linked Polyethylene</td>
<td>Abdellah Medjdoub, Ahmed Boubakeur and Thierry Lebey</td>
</tr>
<tr>
<td>7B-13</td>
<td>Band Gap Energies of Several Insulating Polymers Estimated by Optical Absorption Measurements</td>
<td>Yoshimichi Ohki, Norikazu Fuse and Tomoyuki Arai</td>
</tr>
</tbody>
</table>
7B-14 Dynamic Faraday Magneto-Optical Properties of the Water-Based Fe₃O₄ Magnetic Fluids........664
Du Lin, Wang Shibin and Lin Shen

Session 8 Aging and Charge Storage and Transport(Oral)

8-1 Ageing Behaviour of Vegetable Oil Blends.................................................................668
Ian Hosier, Chris Rogers, Alun Vaughan and Steve Swingler

8-2 Dielectric Response of Polyimide to Thermal and Saline Degradation .......................672
Li Li, Nicola Bowler, Peter Hondred and Michael Kessler

8-3 Time Behavior of Gas Pressure and PD Activity in Insulation Cavities Under AC Voltage......676
Le Wang, Andrea Cavallini and Gian Carlo Montanari

8-4 Aging Effects of Conductor Surface Conditions on AC Corona Discharge .......................680
Xingming Bian, Xuesong Zhao, Jin Cao, Lili Gu, Liming Wang and Zhicheng Guan

8-5 Conductivity and Space Charge in LDPE/BaSrTiO₃ Nanocomposites..........................684
Robert Fleming, Anne Ammala, Philip Casey and Sidney Lang

8-6 Studies of Charge Build Up and Transport in Electron Beam Irradiated Polymers in a New
Irradiation Chamber........................................................................................................688
V. Griseri, P. Malaval, L. Berquez, T. A. Tung, S. LeRoy, L Boudou and A. Boulanger

Additional Papers

Evaluation of Epoxy Nanocomposites for Electrical Insulation Systems..........................692
Su Zhao, Henrik Hillborg, Eva Martensson, Goran Paulsson

Dielectric Properties of Isotactic Polypropylene and Montmorillonite Nanocomposites .......695
E. Izci, N. Bowler