

07CH37929

**2007 Annual Report  
Conference on  
Electrical Insulation  
and Dielectric Phenomena**

**October 14-17, 2007  
The Fairmont Hotel Vancouver  
Vancouver, British Columbia, Canada**

# Contents

## Whitehead Lecture

Aiming at a More Rigorous Understanding in Electrical Insulating Materials Research <i>Yoshimichi Ohki</i> .....	1
---	---

## Session 1 Oral: General

1-1	Lifetime Characteristics of Nanocomposite Enameled Wire Under Surge Voltage Application <i>Hitoshi Okubo, Yusuke Nakamura, Hiroshi Inano, Naoki Hayakawa, Satoshi Hiroshima, Tatsuya Hirose and Masahiro Hamaguchi</i> .....	13
1-2	Reliability Estimation of Paper Insulated Components <i>Arjan van Schijndel, Jos M. Wetzer and Peter A.A.F. Wouters</i> .....	17
1-3	Electro-Mechanical Modeling of Biomimetic Actuation Behavior of Electro-Active Paper (EAPap) <i>Ravindra Joshi, Francis Mbaye, Prathap Basappa and SangDong Jang</i> .....	21
1-4	Electrical Conductivity in LDPE Containing Nano-and Micro-Sized ZnO Particles <i>Robert Fleming, Anne Ammala, Philip Casey and Sidney Lang</i> .....	25
1-5	Influence of the Temperature on the Properties of Microcomposite Nano-Filled Epoxy <i>Jerome Castellon, Serge Agnel, Alain Toureille, Michel Fr�chet, Mandana Javan, Kenneth Cole, Dominique Desgagn�s and Gerard Platbrood</i> .....	29
1-6	The Influence of Absorbed Gases on Electroluminescence Phenomenon in Polymeric Materials Subjected to High Electrical Stress <i>A. Mohd Ariffin, P.L. Lewin and S.J. Dodd</i> .....	33

## Session 2 Poster: Aging, Partial Discharges, Treeing

2-1	Experimental Studies of the Aging Characteristics of the ADSS Fiber Optic Cables <i>Essam Al-Ammar, George Karady, Monty Tuominen and Danna Vermeers</i> .....	37
2-2	Remaining Service Life Diagnostic Technology of Phenol Insulators for Power Distribution Equipment <i>Shinsuke Miki, T. Hasegawa, S. Umemura, Hiroshi Okazawa, Y. Otsuka and Hiroshi Inujima</i> .....	41
2-3	Performances of Dielectric Greases for Rolling Bearings Employed in High Power Induction Motors Fed by PWM Inverters <i>Gianfranco Costabile, Biagio De Vivo, Luigi Egiziano, Patrizia Lamberti and Vincenzo Tucci</i> .....	45

2-4	Investigation on Thermal Endurance of PVC Compounds for Low Voltage Cable Insulation <i>Massimo Marzinotto, Giovanni Mazzanti, Carlo Mazzetti, Massimo Pompili, Carlo Santulli and Prospero Schiaffino</i> .....	49
2-5	Effect of Gas Impregnation in Silicone Rubber on Electrical Tree Initiation <i>Yoshihisa Kamiya, Yuji Muramoto and Noriyuki Shimizu</i> .....	53
2-6	Detection of Tracking of Cord Plug Based on Surface Current Characteristics <i>Masahiro Yagi, Akira Yokotani and Yukio Mizuno</i> .....	57
2-7	Diagnosis of Short Circuit Fault of Induction Motor Based on Hidden Markov Model <i>Hisahide Nakamura, Yousuke Yamamoto and Yukio Mizuno</i> .....	61
2-8	Effect of Artificial Thermal Aging on the Crystallinity of XLPE Insulation Cables : X-Ray Study <i>Boukezzi Larbi, Boubakeur Ahmed and Lallouani Mouhamed</i> .....	65
2-9	Ageing Behaviour of Dodecylbenzene/mineral Oil Blends <i>Ian Hosier, Alun Vaughan and Simon Sutton</i> .....	69
2-10	Dissipation Current Waveform and Its Spectrum of Water Tree Deteriorated Low Density Polyethylene Sheet. <i>Takamasa Furuhashi, Kazuyuki Tohyama, Tomoaki Imai and Kazutoshi Abe</i> .....	73
2-11	Influence of Oil Type on the Oil-Paper Insulation Properties <i>Pavel Prosr, Radek Polanský, Josef Pihera. and P. Trnka</i> .....	77
2-12	Study on Aging Characteristics for Inverter-Fed Traction Motor Inter-Turn Insulation Based on Analysis of Dielectric Characteristic Parameters <i>Jingyan He, Guangning Wu, Bo Gao and Jiandong Wu</i> .....	81
2-13	Realization of Different Electric Signal Fire Resistant Cables and Carrying Out of a “Real Scale” Test. Analysis and Discussion of the Obtained Results. <i>Francesco Guastavino, Gianfranco Coletti, Alessandro Ratto, Paolo Michelato, Marcello Celentano and Andrea Zucchelli</i> .....	85
2-14	New Approach Towards Protecting Electrical Equipment Insulation Systems Against Very Fast Transients <i>Wojciech Piasecki, Grzegorz Bywalec, Florkowski Marek, Marek Fulczyk and Jakub Furgal</i> .....	89
2-15	Investigation of Electrical Failures in Porcelain Cap and Pin Line Insulators <i>Ankit Mishra and Ravi Gorur</i> .....	95
2-16	Aged Oil-Paper Classification using Statistical Parameters and Clustering Analysis <i>Feng Zhang, Jian Li, Ruijin Liao and Stanislaw Grzybowski</i> .....	99

2-17	Study on Replacement Postponement of Aged Insulated Power Equipment <i>Julius Aguni</i> .....	103
2-18	Investigation on Aging Mechanism of Winding Insulation used in Inverter-Fed Traction Motors <i>Bo Gao, Guangning Wu, J.Y. He and K.G. Lei</i> .....	107
2-19	Monitoring Electrically-Active Defects in Silica-Filled Epoxy using Light Detection <i>Eddy Aubert, Gilbert Teyssèdre, Christian Laurent and S. Rowe</i> .....	112
2-20	GIS Partial Discharge Quantitative Measurements using UHF Microstrip Antenna Sensors <i>Tang Ju, Xu Zhongrong, Zhang Xiaoxing and Sun Caixin</i> .....	116
2-21	Simulation of Shock Wave Due to Partial Discharge using Finite Element Method <i>Syed Aqeel Ashraf, Brain G. Stewart, Donald Hepburn and Chengke Zhou</i> .....	120
2-22	Modification of Terylene Fabric by Homogeneous Discharge in Air at Atmospheric Pressure <i>Ting Mao, Zhicheng Guan, Hiyun Luo, Zhuo Liang, Xinxin Wang, Zhidong Jia and Liming Wang</i> .....	124
2-23	Partial Discharge Inception Characteristics by Different Measuring Methods in Magnet Wire under Surge Voltage Application <i>Naoki Hayakawa, Hiroshi Inano and Hitoshi Okubo</i> .....	128
2-24	Modeling Partial Discharges in a Cavity at Different Applied Frequencies <i>Cecilia Forssen and Hans Edin</i> .....	132
2-25	Evaluation of the Operative State of Power Capacitors of the Distribution System <i>Jr. Hélio Amorim, André Carvalho and Alain Levy</i> .....	136
2-26	DCPD Acquisition and Analysis for HV Storage Capacitor Based on Matlab <i>Shanshan Bian, Guangning Wu, Xueqin Zhang and Xiaohua Li</i> .....	141
2-27	Frequency Domain Analysis of Acoustic Emission Signals for Classification of Partial Discharges. <i>Prasanta Kundu, Krishna Kishore Nudurupati and A.K. Sinha</i> .....	146
2-28	The Influence of Power Supply on Lean NO <sub>x</sub> Removal by Plasma-Facilitated Selective Catalytic Reduction <i>Jingyi Wang, Yong Nie, Kan Zhong, Liming Wang and Zhicheng Guan</i> .....	150
2-29	Partial Discharges and Streamers in Silicone Gel used to Encapsulate Power Electronics Components <i>Minh Tuan Do, Olivier Lesaint and Jean Louis Augé</i> .....	155
2-30	Fibre Optics in Board Arrangements with Respect to Partial Discharge <i>Michael Muhr, Robert Schwarz and Stefan Jaufer</i> .....	159

2-31	Modern Technologies in Optical Partial Discharge Detection <i>Robert Schwarz and Michael Muhr</i> .....	163
2-32	Optimal Feature Selection for Defect Recognition in Varying Concentration SF <sub>6</sub> :N <sub>2</sub> Mixtures <i>Thavenesen Govender and Ian Jandrell</i> .....	167
2-33	Electroluminescence Properties and Degradation of XLPE <i>Takamori Mito, Yuji Muramoto and Noriyuki Shimizu</i> .....	171
2-34	Partial Discharges in Internal Voids: Dependence on Defect Position with Respect to Electrodes <i>Gian Carlo Montanari, Andrea Cavallini and Fabio Ciani</i> .....	175
2-35	Characterization of Patch Antennae for PD Detection in Power Cables <i>Andrea Cavallini, Gian Carlo Montanari and Alessandro Salsi</i> .....	179
2-36	Partial Discharges at Sub-Atmospheric Pressures -- Methods of Analysis of Experimental Results <i>Xin Liu, Stephen Sebo, Donald Kasten, Daniel Schweickart and Dennis Grosjean</i> .....	183
2-37	Partial Discharge Pulse Shape Detection and Analysis under DC Condition in Typical Defect Models <i>Xiaohua Li, Guangning Wu, Xueqin Zhang and Shanshan Bian</i> .....	188
2-38	Recognition of UHF PD Signals in Transformers Based on Wavelet and Fractal Theory <i>Zhuorui Jin, Youyuan Wang, Jiaxin Ning, Jian Li and Xuesong Wang</i> .....	192
2-39	RPDIV/RPDEV Characteristics of Twisted-Pair under Repetitive Bipolar Impulse Condition <i>Kenichi Fukunaga, Okada Shinichi, Shinya Otsuka, Masayuki Hikita and Ken Kimura</i> .....	196
2-40	The Propagation Characteristics of Electromagnetic Wave Generated from Partial Discharges in Power Transformer by FDTD Simulation <i>Zhiguo Tang, Chengrong Li, Wei Wang, Hui Wang, Li Wang and Yansheng Ding</i> .....	200
2-41	An Improved MSD-Based Method for PD Pattern Recognition <i>Roberto Candela and Pietro Romano</i> .....	204
2-42	Space Charges in Polymers and Their Influence on Electrical Treeing <i>Rainer Patsch, Yanuar Z. Arief, Djamel Benzerouk and Johannes Menzel</i> .....	208
2-43	The Experiment Research of Fuzzy Clustering Application in Pattern Recognition of GPD <i>Zheng Dian-chun, He Lan-xiang and Bai Shao-zuo</i> .....	213
2-44	Wavelets-Based Partial Discharge Signal Analysis in GIS <i>Seethamraju Sagar, J. Amarnath and S.V.L. Narasintham</i> .....	217

2-45	The Role of Power Quality in Electrical Treeing of Epoxy Resin <i>Sanjay Bahadoorsingh and Simon Rowland</i> .....	221
------	---	-----

### Session 3 Poster: Nanodielectrics, Outdoor Insulation

3-1	Dielectric Properties of Polyvinyl Alcohol Filled with Nanometer Size Barium Titanate Particles <i>Enis Tuncer, Robert C. Duckworth, Isidor Sauers, D. Randy James and Alvin R. Ellis</i> .....	225
3-2	Characteristics of Partial Discharge and Time to Breakdown of Nanocomposite Enameled Wire <i>Yoshinobu Uozumi, Yusuke Kikuchi, Naoyuki Fukumoto, Masayoshi Nagata, Yasuo Wakimoto and Tetsuo Yoshimitsu</i> .....	228
3-3	Effects of Curing and Filler Dispersion Methods on Dielectric Properties of Epoxy Nanocomposites <i>Naoki Tagami, Masahide Okada, Naoshi Hirai, Toshikatsu Tanaka, Yoshimichi Ohki, Takahiro Imai, Miyuki Harada and Mitsukazu Ochi</i> .....	232
3-4	Different Voltage Endurance Characteristics of Epoxy/Silica Nanocomposites Prepared by Two Kinds of Dispersion Methods <i>Tomonori Iizuka, Katsumi Uchida and Toshikatsu Tanaka</i> .....	236
3-5	Electrical Treeing Inception and Growth in LDPE Nanocomposites <i>Francesco Guastavino, Andrea Dardano, Eugenia Torello, Mario Hoyos Nunez, Jose' Manuel Gomez Elvira and Pilar Tiemblo</i> .....	240
3-6	Resistance to Surface Partial Discharges of LDPE Nanocomposites <i>Francesco Guastavino, Andrea Dardano, Alessandro Ratto, Eugenia Torello, Mario Hoyos Nunez, Jose' Manuel Gomez Elvira and Pilar Tiemblo</i> .....	244
3-7	Dissipation Current and Electroluminescence of LDPE/MgO Nanocomposite Material under Trapezoidal Waveforms Application <i>Kensuke Hinata, Ayano Fujita, Kazuyuki Tohyama, Youitsu Sekiguchi and Yoshinao Murata</i> .....	248
3-8	Dielectric Characterization of a Nanostructured Polymer Microcomposite and Its Constituents <i>Mandana Javan-Mashmool, Michel Fréchette, Michel Lessard, Ray Bartnikas, Kenneth Cole and Dominique Desgagnés</i> .....	252
3-9	Time-Evolution of Nanostructured Epoxy Resin Degradation Due to Surface Partial Discharge Activities <i>Andrea Cavallini, Davide Fabiani and Gian Carlo Montanari</i> .....	256
3-10	Conduction Current Characteristics and Trap Level of Nano- Al <sub>2</sub> O <sub>3</sub> Composite Polyimide Films <i>Peihong Zhang, Feng Chen, Yang Liu and Qingquan Lei</i> .....	260

3-11	Molecular Dynamics Simulation of Characteristics of Polymer Matrices in Nanocomposites <i>Fumio Sawa, Takahiro Imai, Tamon Ozaki, Toshio Shimizu and Toshikatsu Tanaka</i> .....	263
3-12	Characterization of Nanofilled Epoxy Varnish Subjected to Surface Partial Discharges <i>Francesco Guastavino, Matteo Balbo, Gianfranco Coletti, Fulvio Zunino and A. Oldrati</i> .....	267
3-13	Space Charge Formation in LDPE/MgO Nano-Composite under High Electric Field at High Temperature <i>Takuya Maezawa, Junya Taima, Yuji Hayase, Yasuhiro Tanaka, Tatsuo Takada, Youitsu Sekiguchi, and Yoshinao Murata</i> .....	271
3-14	Space Charge in LLDPE Loaded with Nanoparticles <i>George Chen, Chao Zhang and Gary Stevens</i> .....	275
3-15	The Role of Molecular Dielectrics in Shaping the Interface of Polymer Nanodielectrics <i>Michel Fréchette and Clive Reed</i> .....	279
3-16	Studies to Unravel Some Underlying Mechanisms in Nanodielectrics <i>Robert Smith, Congcong Liang, Michael Landry, J. Keith Nelson and Linda Schadler</i> .....	286
3-17	DC Conduction and Electrical Breakdown of MgO/LDPE Nanocomposite <i>Suguru Masuda, Shunsuke Okuzumi, Rudi Kurniant, Yoshinobu Murakami, Masayuki Nagao, Yoshinao Murata, and Youitsu Sekiguchi</i> .....	290
3-18	Investigation of the Hydrophobicity Transfer of Polymeric Insulating Materials Through Artificial Pollution Layers <i>Florian Exl and Josef Kindersberger</i> .....	294
3-19	Influence of Fillers on Silicone Rubber for Outdoor Insulation <i>Su Fang, Zhidong Jia, Haifeng Gao and Zhicheng Guan</i> .....	300
3-20	Mechanical Parameter Optimization of Interphase Composite Spacer used for Controlling Conductor Galloping <i>Lei Hou, Liming Wang, Dong Yan, Ming Lu and Zhicheng Guan</i> .....	304
3-21	Study on Hydrophobicity Recovery Characteristics and Mechanism of HTV Silicone Rubber After Corona Deterioration <i>Ying Liang, Lijian Ding, Kun Yang, C.R. Li, and Youping Tu</i> .....	308
3-22	Relation Between Dry Band Arc Discharge Development and Erosion Shape on the Silicone Rubber <i>Kenichi Haji, Yong Zhu, Masahisa Otsubo, Tatsuya Sakoda and Chikahisa Honda</i> .....	312
3-23	Effect of Temperature on the Evaluation of Hydrophobic Condition of Polymer Surface <i>Tetsuro Tokoro, Akira Ohno and Masayuki Nagao</i> .....	316

3-24	An Artificial Pollution Test on Silicone Rubber Insulators Under Long-Time Wetted Conditions <i>Linjie Zhao, Chengrong Li, Jun Xiong, Cong Wang, Shuqi Zhang and Yongjiang Bi</i> .....	320
3-25	Experimental Investigation on Flashover Performance of Glass Insulators for UHVDC Transmission Lines at High Altitudes <i>Fuzeng Zhang, Yingke Mao, Xin Wang, Liming Wang, Zhicheng Guan, Hua Wen, Ruihai Li and Yi Ma</i> .....	324
3-26	Tracking and Erosion Performance of Liquid Silicone Rubber HV Composite Insulator Housings <i>Jens Martin Seifert, Hans-Jörg Winter, Roland Bärsch and Alajos Bognár</i> .....	329
3-27	Arc Endurance Modeling of Polymeric HV Outdoor Insulating Materials <i>Balasubramanian Pinnangudi, Ravi Gorur and Govinda Raju Gorur</i> .....	338
3-28	Frequency Characteristics of Leakage Current for Monitoring Silicone Rubber Insulator in Cold-Fog Conditions <i>Boxue Du, Liu Yong and Yang Cheng</i> .....	342
3-29	Study on Weather-Related Natural Contaminant Deposit Prediction of Insulators Based on Neural Network <i>Yanming Li, Gang Liu, Xiyang Chen and Yan Xing</i> .....	346
3-30	Discussion on Relation of Weather Statistics and Natural Contaminant Deposit Prediction of Insulators <i>Xiyang Chen, Longjun Zhang, Gang Liu, Pingyuan Liu and Linhai Zhang</i> .....	349
3-31	Power Transmission Lines Maintenance System Base on Google Earth (GE) Platform <i>Fan Yang, Gang Liu, Xiyang Chen, Runping Lin and Chang Xue</i> .....	352
3-32	Study on Location of All-Dielectric Self-Supporting Fiber-Optic Cables on Power Transmission Towers <i>Haiyan Wang, Gang Liu, Wenxiang Li, Zhiyong Liu and Yan Xing</i> .....	356
3-33	Hydrophobic Stability of Silicone Rubber After Water Immersion <i>Henrik Hillborg, Xavier Kornmann, Andrej Krivda, Patrick Meier and Lars Schmidt</i> .....	360
3-34	Impedance Analysis of Long Term Aged Thermoplastic Elastomeric Insulators <i>Raji Sundararajan, Claudia Olave, Edwin Romero and A.M. Kannan</i> .....	364

#### **Session 4 Oral: General**

4-1	Effect of Surface Charges on the Flashover Voltage Characteristics of Polymeric Materials: Comparison Between Theory and Practice <i>Raul Montaña, Hans Sjöstedt, Yuriy Serdyuk and Stanislaw Gubanski</i> .....	368
-----	---	-----

4-2	The Influence of Water on Dielectric Behavior of Silica-Filled Epoxy Nano-Composites and Percolation Phenomenon <i>Chen Zou, M. Fu, J.C. Fothergill and S. Rowe</i> .....	372
4-3	In-Service Diagnostic of Polymeric Insulators Exposed to Severe Contamination <i>Ramiro Hernandez Corona and Gerardo Montoya-Tena</i> .....	376
4-4	Novel Charge Generation Model for Simulation of Streaming Current Based on Shearing Stress at the Oil/pressboard Interface <i>Hiroataka Muto, Kosei Tsuji and Koji Kise</i> .....	380
4-5	Silicone Rubber Nanocomposites for Outdoor Insulation Applications <i>Isaias Ramirez, Edward Cherney, Shesha Jayaram and Mario Gauthier</i> .....	384
4-6	A Multifactor Framework Linking Insulation Aging and Power Network Environments <i>Sanjay Bahadoorsingh and Simon Rowland</i> .....	388

**Session 5 Poster: Charge Storage, EHD, Flow Electrification, Field Mapping, Polarization, High Field Phenomena, Surface flashover, Biodielectrics**

5-1	Thickness Dependence of Carbon Electrode on Space Charge of Electric Double Layer Capacitor <i>Daisuke Tashima, Mitsufumi Taniguchi, Masahisa Otsubo, Akihito Okazaki and Shuuichi Araki</i> .....	392
5-2	Temperature Dependence of Capacitance in Electrochemical Super Capacitor <i>Mitsufumi Taniguchi, Daisuke Tashima and Masahisa Otubo</i> .....	396
5-3	Analysis of the Leakage Current Pulses of Outdoor Insulators in Different Relative Humidity <i>Mao Yingke, Guan Zhicheng and Liming Wang</i> .....	400
5-4	The Negative Heterocharge Generation Mechanism in Polymeric Dielectrics <i>Yasuo Sekii, Hirokazu Suzuki, Kazuo Noguchi and Takashi Maeno</i> .....	404
5-5	Space Charge Formation in Polyimide/Carbon Compound Film for Electronics Devices <i>Masayo Satou, Kiichirou Matsushita and Yoshio Oota, Minoru Ezo</i> e .....	409
5-6	Experimental Measurements and Computer Modeling of Charge Relaxation on Surfaces of Polymeric Insulating Materials <i>Hans Sjöstedt, Yuriy Serdyuk, Raul Montaña and Stanislaw Gubanski</i> .....	413
5-7	Space Charge Trapping in Electrical Potential Well Caused by Permanent and Induced Dipoles <i>Tatsuo Takada, Yuji Hayase, Yasuhiro Tanaka and Tatsuki Okamoto</i> .....	417

5-8	Fast Charge Packet Dynamics in XLPE Insulated Cable Models <i>Saverio Delpino, Davide Fabiani, Gian Carlo Montanari, Len Dissado, Christian Laurent and Gilbert Teyssebre</i> .....	421
5-9	Temperature Dependence of Charge Packet Velocity in XLPE Cable Peelings <i>Leonard Dissado, Susannah Zadeh, J.C. Fothergill and Alex See</i> .....	425
5-10	Pulse Electro-Acoustic Measurements with Contact and Contact-Less on Electron Irradiated Polymers. <i>Virginie Griseri, Charlotte Perrin, Kaori Fukunaga, Takashi Maeno, D. Payan, Bernard Dirassen and Christian Laurent</i> .....	429
5-11	Experimental Regarding the Evolution of Space Charge in Polyolefins Insulation <i>Marius Olariu, Romeo Ciobanu, Stefan Ursache and Sebastian Aradoaei</i> .....	433
5-12	Surface Charge Measurement of Gamma-Rays Irradiated Polymer Insulating Materials <i>Boxue Du and Gao Yu</i> .....	437
5-13	Influences of Annealing Method on Space Charge Characteristics of Low Density Polyethylene <i>Yuanxiang Zhou, Ninghua Wang, Yunshan Wang, Hongbin Liu, Xidong Liang and Zhicheng Guan</i> .....	441
5-14	Packet-Like Charge Behavior in Various Kinds of Polyethylene <i>Yuji Hayase, Kohei Matsui, Yasuhiro Tanaka, Tatsuo Takada and Takashi Maeno</i> .....	445
5-15	Charging Behavior and Thermal Stability of Porous and Non-Porous Polytetrafluoroethylene (PTFE) Electrets <i>Michael Wegener, Werner Wirges, Mika Paaajanen and Reimund Gerhard</i> .....	449
5-16	Three-Layer Ferroelectrets from Perforated Teflon® PTFE Films Fused Between Two Homogeneous Teflon-FEP Films <i>Heitor Basso, Ruy Alberto Altafim, Ruy Altafim, Axel Mellinger, Peng Fang, Werner Wirges and Reimund Gerhard</i> .....	453
5-17	Method for Characterizing Charge Spreading in Sintered Alumina by Secondary Electron Emission: Effect of Microstructure and Temperature <i>Kamel Zarbout, Abderrhman Si Ahamed, Gérard Moya, Gilles Damamme, Jean Bernardini and Kallel Ali</i> .....	457
5-18	Estimate of Carrier Balance and Exciton Distribution in Organic Light-Emitting Diode <i>Tatsuo Mori and Yusuke Masumoto</i> .....	461
5-19	Pumping Electrolytes with Arrays of Electrodes Subjected to Travelling-Wave Potentials: Electrode Design <i>Pablo García-Sánchez, Antonio Ramos and Antonio Castellanos</i> .....	465

5-20	Experimental Investigation of Thermal Boundary Layer Thickness Effects on Corona Discharge Current with Razor-Isothermal Cylinder Geometry <i>Mehdi Ashjaee and Seyed Reza Mahmoudi</i> .....	469
5-21	Converting Wind Energy to Electrical Energy using Charged Droplets in an Electric Field <i>Dhiradj Djairam, Wietze Nijdam, Jos Balendonck, Peter Morshuis and Johan Smit</i> .....	474
5-22	Optimising Electrode Design and Positioning for EHDA Produced Particles in an EWICON <i>Dhiradj Djairam, Peter Morshuis and Johan Smit</i> .....	478
5-23	Experimental Research on Electrostatic Field Enhancement of Condensation Heat Transfer <i>Chuntian Chen, Liangyu Chen, Xiaofeng Zhou and Xiaoyan Du</i> .....	482
5-24	A Simulation Method for Streaming Electrification by Direct Current Field Analysis <i>Kosei Tsuji, Hirotaka Muto and Koji Kise</i> .....	485
5-25	Electric Field Distribution in DC Polymeric Power Cable in the Presence of Space Charge <i>Wilson Choo and George Chen</i> .....	489
5-26	A Study on the Space Charge Distribution of ZnO Varistor <i>Youping Tu, Lijian Ding, Qian Wang, Rong Shi and C.R. Li</i> .....	493
5-27	3D Cartography of Space Charges Induced by UV Irradiation <i>Anca Petre, Dominique Mary, C.D. Pham, and Laurent Berquez</i> .....	496
5-28	Dielectric Properties of Rapeseed Oil-Paper Insulation <i>Jian Li, Stanislaw Grzybowski, Yanfei Sun and Xiaoling Chen</i> .....	500
5-29	Dielectric Behavior of Syntactic Foams at Low Temperatures and Frequencies <i>T.M. Andritsch, A. Lunding, P.H.F. Morshuis, H. Negle and J.J. Smit</i> .....	504
5-30	Electrical Modeling of a $\text{CaCu}_3\text{Ti}_4\text{O}_{12}$ Ceramic for Capacitor Applications <i>A. Rumeau, P. Bidan, T. Lebey, B. Barbier, C. Combettes and S. Guillemet</i> .....	508
5-31	The Collection Volume Method for Lightning Protectors Placement on Naval Ships <i>Ahmed Hossam Eldin and Ehab Omran</i> .....	512
5-32	An Experimental Study on SF <sub>6</sub> Gas Decomposition by Silent Discharge Process and Fixation of By-Products on Calcium Hydroxide <i>Toru Kono and Ryu-ichiro Ohyama</i> .....	517
5-33	NO <sub>x</sub> Treatment in Diesel Engine Combustion Exhaust Gases by Vacuum Ultra-Violet Irradiation <i>Kimihiko Ueno and Ryu-ichiro Ohyama</i> .....	521

5-34	Fundamental Characteristics on Plasma Diagnoses of Gas-Jet Type Atmospheric Pressure Plasma <i>Michisuke Sakamoto, Sinsuke Kikuchi and Ryu-ichiro Ohyama</i> .....	525
5-35	An Experimental Analysis of Ionic Wind Velocity Characteristics in a Needle-Plate Electrode System by Means of Laser-Induced Phosphorescence <i>Yu Kitahara, Kentaro Aoyagi and Ryu-ichiro Ohyama</i> .....	529
5-36	Stress grading in integrated power modules <i>Cyrille Duchesne, Thierry Lebey, Michel Mermet-Guyennet, Emmanuel Dutarde and Selim Dagdag</i> .....	533
5-37	The Influence of Contaminations on HVDC Conductor Corona Characteristics <i>Minhua Ma, Yuming Zhao, Zhicheng Guan and Liming Wang</i> .....	537
5-38	Study on Corona Discharge of Winding Cable in Linear Motor <i>Chengyan Ren, Ping Yan and Jue Wang</i> .....	542
5-39	Steep-Front Electric Stress Phenomena on the Electric Insulation in Pulsed Rotating Generators Incorporating Fast Magnetic Flux Compression <i>Mircea Driga and Robert E. Hebner</i> .....	545
5-40	Dechlorination Mechanism of PCBs by Microwave Irradiation <i>Akiko Kumada, Ryotaro Yoshida, Kunihiko Hidaka, Kouji Amano and Koichi Itoh</i> .....	550
5-41	Experimental Investigation of Nucleate Boiling Heat Transfer Enhanced by Non-Uniform Electric Field <i>Chuntian Chen, Lijuan He, Xuedong Li and Litao Fu</i> .....	554
5-42	Online Detection System for Contaminated Insulators Based on Ultra-Violet Pulse Method <i>Ji Yang, Xu Tao, Tang Jianjun, Xiong Lan and Zhang Zhan-long</i> .....	558
5-43	Study on Influence of the No-Uniformity of Pollution at the Surface of HVAC Lines Insulators on Flashover Probability <i>Mohamed El mine Slama, Hocine Hadi and Samir Flazi</i> .....	562
5-44	PMMA DC Surface Flashover in Vacuum After Thermal Treatment <i>Weiqun Yuan, Desheng Wang, Ping Yan and Shiyong Yang</i> .....	567
5-45	Creep Stress Failure in High Voltage Transformer Interwinding Insulation <i>Peter Mitchinson, Paul Lewin, George Chen and Paul Jarman</i> .....	572
5-46	Effects of Roughness on Surface Flashover Voltages Under DC Stress <i>Ricardo Victoria Lopez, Ernst Gockenbach, Hossein Borsi, Hans Negle and Arne Lunding</i> .....	576
5-47	Mechanism of Functionality of Semi-Conducting Materials and Reliable in Anti-Corona Protection Designs of the High-Voltage Generator Windings <i>Rimma Malamud and Ivan Cheremisov</i> .....	580

5-48	Dielectric Properties of Oil Palm-Natural Rubber Biocomposites <i>Massimo Marzinotto, Carlo Santulli and Carlo Mazzetti</i> .....	584
5-49	Investigation of the Impregnation of Cellulosic Insulations by Ester Fluids <i>Jie Dai, Z.D. Wang, Paul Dyer, A.W. Darwin and Ian James</i> .....	588
5-50	Electrical Conduction Properties of Several Biodegradable Polymers <i>Naoshi Hirai, Hiroto Ishikawa and Yoshimichi Ohki</i> .....	592

## Session 6 Oral: General

6-1	Thermal Bubble Behaviour in Liquid Nitrogen Between Inclined Plane Electrodes <i>Ping Wang, David Swaffield, Paul Lewin and George Chen</i> .....	596
6-2	Reduction of Breakdown Appearance by Automatic Geometry Optimization <i>Zoran Andjelic and Salih Sadovic</i> .....	600
6-3	Effect of Particle Dimensions and Pre-Processing of Nanoparticles in Improving Surface Degradation Characteristics of Nanodielectrics <i>Parimal Maity, Subramanyam Kasisomayajula, Sumit Basu, Venkitanarayanan Parameswaran and Nandini Gupta</i> .....	604
6-4	A Molecular Model for the Electrical Aging of XLPE <i>Jean-Pierre Crine</i> .....	608
6-5	Power Transformer Condition Assessment using Oil UV - Spectrophotometry <i>Muhammad Arshad and Syed M. Islam</i> .....	611
6-6	Effect of Solution Rate on Electrospinning <i>Ying Yang, Zhidong Jia, Jianan Liu, Liming Wang and Zhicheng Guan</i> .....	615

## Session 7 Poster: Breakdown Phenomena, Measurement Techniques

7-1	Effects on Tensile Strength of Transformer Insulation Paper under Accelerated Thermal and Electrical Stress <i>Piush Verma, D.S. Chauhan and Prof. Preetinder Singh</i> .....	619
7-2	High Voltage Breakdown and Pre-Breakdown Properties in Rape-Seed Insulating Oil <i>Chau Tran Duy, Olivier Lesaint, Nelly Bonifaci, André Denat and Yves Bertrand</i> .....	623
7-3	The Mechanism of High Voltage Storage Capacitor under Large Impulse Discharge <i>Xueqin Zhang, Guangning Wu, XiaoHua Li, Shanshan Bian and Qian Peng</i> .....	627
7-4	Electro-Thermal Simulation Studies for Pulsed Voltage Induced Energy Absorption and Potential Failure in Microstructured ZnO Varistors <i>Ravi Joshi, Guogang Zhao, Jiahui Song and Vishnu Lakdawala</i> .....	631

7-5	Morphology and Crystallisation Kinetics of Polyethylene / Montmorillonite Nanocomposites <i>Christopher Green and Alun Vaughan</i> .....	635
7-6	Space Charge Signal in Line-Plate Electrode System under DC Field on PEA Method <i>Masumi Fukuma and Takanobu Itoga</i> .....	639
7-7	Influence of Ambient Temperature on the Failure Behaviour of Cable Joints <i>Rogier Jongen, Peter Morshuis, Johan Smit and Anton Janssen</i> .....	643
7-8	Moisture and Temperature Effects on Conduction and Losses in Modified Rape-Seed Insulating Oil <i>Chau Tran Duy, André Denat, Olivier Lesaint, Nelly Bonifaci and Yves Bertrand</i> ....	647
7-9	Current Conduction Instabilities in Polyethylene During Heat Cycles <i>Dominique Mary, Seoudoua Mbarga, David Malec and Laurent Boudou</i> .....	651
7-10	Surge Voltage Performance of Power Transformer Winding Sections Provided with Metal Oxide Surge Absorber Blocks with Faults in Portion of Sections <i>G.R. Gurumurthy, Mohd Z.A. Ansari and J. Amarnath</i> .....	655
7-11	Pre-Breakdown Characteristics of Contaminated Power Transformer Oil <i>George Chen and M.H. Zuber</i> .....	659
7-12	Simulation of the Discharge Expansion of a Spark Discharge at Small Distances Between Electrodes <i>Hans-Peter Schulze, Oliver Kröning and Marco Leone</i> .....	663
7-13	Experimental Characterization and Numerical Modeling of a Wire-To-Cylinder Corona Discharge Ozonizer <i>Khelifa Yanallah, Francisco Pontiga, Agustín Fernández-Rueda, Antonio Castellanos and Ahmed Belasri</i> .....	667
7-14	Ozone and Nitrogen Oxides Production by DC and Pulsed Corona Discharge <i>Francisco Pontiga, Helena Moreno and Antonio Castellanos</i> .....	671
7-15	Study of Dielectric Properties of Electro-Active Paper <i>SangDong Jang, Prathap Basappa and Jaehwan Kim</i> .....	675
7-16	Surface Breakdown of Gamma-Ray Irradiated Polybutylene Polymers under Magnetic Field <i>Boxue Du, Shen Fu and Liu H.J.</i> .....	679
7-17	Homogeneous Dielectric Barrier Discharge in Air for Surface Treatment <i>Zhan Huamao, Li Chengrong, Xu Jinbao, Li Ming and Wang Wei</i> .....	683
7-18	Determination of Breakdown Voltages in SF <sub>6</sub> /N <sub>2</sub> Gas Insulated Line <i>Poonam Upadhyay, J. Amarneth, B.P. Singh and Pravin Upadhyay</i> .....	687

7-19	Effect of VLF/LF Frequency and Humidity on the Breakdown of Air <i>Doeg Rodriguez, Gopakumar Gopinathan, Ravi Gorur and Peder Hansen</i> .....	691
7-20	Determination of the Response of Ar + SF <sub>6</sub> to Crossed Electric and Magnetic Fields Using an Artificial Neural Network <i>M. Ali Akcayol, Huseyin Hiziroglu and M.S. Dincer</i> .....	695
7-21	Study on Uncoupling Characteristics of Foil Wire in Metallized Capacitors <i>Zhonghua Kong, Lin Fuchang and Dai Lin</i> .....	699
7-22	Influence of Test Conditions on Dielectric Barrier Discharges Operating in Air with Flowing Helium <i>Yanpeng Hao and Xiao Lei Wang</i> .....	703
7-23	Investigation on the Definition and Digital Algorithm of Instantaneous Dielectric Loss Factor <i>Qingmin Li and Li Zhang</i> .....	707
7-24	Diagnostic Technique for Electrical Installation using External Electrode Method: Relationship Between Size of Metal Case and Detected Signal <i>Norimitsu Ichikawa</i> .....	711
7-25	Terahertz Spectroscopy for Analysis of Paintings <i>Kaori Fukunaga, Iwao Hosako, Yuichi Ogawa and Shin'Ichiro Hayashi</i> .....	715
7-26	Influence of Antioxidants and Cross-Linking on the Crystallinity of XLPE Dielectrics <i>Yasuo Sekii</i> .....	719
7-27	Calculating Method of Moisture in Oil-Paper Insulation at Arbitrary Temperature <i>Lijun Zhou, Guangning Wu, Yufei Wang and Hao Tang</i> .....	723
7-28	Dielectric Properties Measurements of Transformer Oil, Paper and Pressboard with the Effect of Moisture and Ageing <i>Chui Fen Ten, Ramesh Manjula Fernando and Zhongdong Wang</i> .....	727
7-29	Comparison of HYDRAN and Laboratory DGA Results for Electric Faults in Ester Transformer Fluids <i>Jie Dai, Imadullah Khan, Z.D. Wang and Ian Cotton</i> .....	731
7-30	Examination of Conversion Degree of Composite Insulating Materials <i>Václav Mentlík and Radek Polanský</i> .....	735
7-31	Simultaneous Observation of Electroluminescence and Dissipation Current Waveform in LDPE Film <i>Shunta Imai, Kazuyuki Tohyama and Masayuki Nagao</i> .....	739
7-32	The Time Recorder for the Accelerated Aging Life Testing of Dielectric Material under High Square Voltage <i>Kegang Lei, Guangning Wu, Bo Gao, Jingyan He and Jun Liu</i> .....	743

7-33	The Application Analysis of on-Line Monitoring System of Dissolved Gas in Transformer Oil <i>Yanming Li, Gang Liu, Yin Liang and Yan Xing</i> .....	747
7-34	Computation and Verification of the Rate Coefficients for Spectral Diagnostics of Streamer Discharges <i>Yuri Shcherbakov and Leonid Nekhamkin</i> .....	751
7-35	Affect of Height of HV Sphere above the Ground in HV Measuring Sphere Gap <i>Krishna Kishore Nudurupati, Gururaj Punekar and Shastry H.S.Y.</i> .....	755
7-36	Fault Diagnosis for Transformer Based on Fuzzy Entropy <i>Jin-Lu Sheng, Ming-shun Zhou, Zu-ping Guo and Zhu Liu</i> .....	759
7-37	Space Charge Accumulation in Polymeric Materials for Spacecraft Irradiated Electron and Proton <i>Hiroaki Miyake, M. Honjoh, S. Maruta, Yasuhiro Tanaka, Tatsuo Takada, K. Koga, Haruhisa Matsumoto, Tateo Goka, B. Dirassen, L. Levy and D. Payan</i> .....	763
7-38	Localization of Faults in a Transmission Line using Wavelet Techniques <i>Bumanapalli Ravindranath Reddy, Ch.Prasanth Babu, M. Swetha, Munagala Suryakalavathi and B.P. Singh</i> .....	767
7-39	Electroluminescence and Space Charge Distribution in XLPE Subjected to AC Fields at Various Frequencies <i>Ayano Fujita, Soli Bamji, M. Abou-Dakka and Alexander Bulinski</i> .....	772
7-40	Assessment of Diffusion Coefficient of Acetophenone in Insulating Polymer by using Conduction Current Measurement <i>Yoshinobu Murakami, Masayuki Nagao, Youitsu Sekiguchi and Yoshinao Murata</i> .....	776
7-41	Space Charge Distribution Synthesis by Multiphysics Simulation: Application to the PWP Techniques <i>Olivier Gallot-Lavallée and Jean-Luc Reboud</i> .....	780
7-42	Kerr Electro-Optic Field Measurement in Palm Oil Fatty Acid Ester Transformer Insulation Systems <i>Shinpei Yamamoto, Katsumi Kato, Fumihiko Endo, Yasunori Hatta, Hidenobu Koide and Hitoshi Okubo</i> .....	784
7-43	Characteristics of Dielectric Barrier Discharges Operating in Air with Flowing N <sup>2</sup> <i>Yanpeng Hao and Xiaolei Wang</i> .....	788
7-44	Analysis and Simulation of Field Distribution in Micro Cavities in Solid Insulating Materials <i>A.A. Hossam-Eldin, S.S. Dessouky, S.M. El-Mekkawy and Ramadan A. Abd EL-Aal</i> .....	792

7-45	Study and Analysis of Field Enhancement and H.V Rating of Power Cables Containing Micro Cavities <i>A.A. Hossam-Eldin, S.S. Dessouky, S.M. El-Mekkawy and Ramadan A. Abd El-Aal</i> .....	797
7-46	Numerical Determination of Electric Field Induced Currents on Human Body Standing under a High Voltage Transmission Line <i>S.M. El-Mekkawy</i> .....	802

### Session 8 Oral: General

8-1	An Alternative Method to Measure Charge Distributions: The Scanning Kelvin Probe <i>Bjoern Martin and Herbert Kliem</i> .....	807
8-2	Contamination Initiated Flashover of Insulators in Generating Stations <i>Sreeram Venkataraman, Ravi Gorur and Kavita Sheno</i> .....	811
8-3	Structure and Dielectric Properties of Amorphous Tantalum Pentoxide Thin Film Capacitors <i>Guneet Sethi, Matthew Olszta, Jing Li, Jennifer Sloppy, Mark W. Horn, Elizabeth C. Dickey and Michael T. Langan</i> .....	815
8-4	Benefits of Synchronous Multi-Channel PD Measurements <i>Kay Rethmeier, Benton Vandiver, A. Obralic, W. Kalkner and Ronald Plath</i> .....	819
8-5	Cathodo- and Electro-Luminescence Spectra in Insulating Polymers : A Parallel Approach for Inferring Electrical Ageing Mechanism <i>Gilbert Teyssedre, Jean-Luc Franceschi and Christian Laurent</i> .....	824
8-6	Dielectric Barrier Discharges During the Generation of Ferroelectrets: Optical Spectroscopy for Process Monitoring <i>Xunlin Qiu, Axel Mellinger, Werner Wirges and Reimund Gerhard</i> .....	828