2020 International Symposium on Electrical Insulating Materials (ISEIM 2020)

Tokyo, Japan 13 – 17 September 2020



IEEE Catalog Number: CFP20448-POD **ISBN:**

978-1-7281-4348-4

Copyright © 2020, The Technical Committee on Dielectrics and Electrical Insulation (TC-DEI) All Rights Reserved

*** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.

IEEE Catalog Number: ISBN (Print-On-Demand): ISBN (Online): CFP20448-POD 978-1-7281-4348-4 978-4-88686-418-5

Additional Copies of This Publication Are Available From:

Curran Asso	ciates, Inc
57 Morehous	se Lane
Red Hook, N	IY 12571 USA
Phone:	(845) 758-0400
Fax:	(845) 758-2633
E-mail:	curran@proceedings.com
Web:	www.proceedings.com



CONTENTS

Inuishi Memorial Lecture

Inuishi	The Role of Theory in Understanding Space Charge Distributions	1
	L. A. Dissado	
	University of Leicester, UK	
Plenary L	Lecture	
Plenary	Effects of Thermal Aging on the Characteristics of Kraft Paper in Various Liquid Insulating	15
	Material	
	Suwarno, Alvin Ritonga	
	School of Electrical Engineering and Informatics, Institut Teknologi Bandung, Indonesia	
Special P	Planned Session 1: Organic Electronics and Bioelectronics for Innovative Devices	
SP1-1	Vapor-deposition Polymerization and Insulating Characteristics of Silsesquioxane Thin Films	25
	Yamato Ogawa, Satsuki Mayuzumi and Hiroaki Usui	
	Tokyo University of Agriculture and Technology, Japan	
SP1-2	Development of Stretchable Devices Using Multi-layer Organic Materials	29
	Atsushi Takei and Manabu Yoshida	
	National Institute of Advanced Industrial Science and Technology, Japan	
SP1-3	Optical Second Harmonic Microscope for Visualizing the Electric Field in Organic Thin Films	32

- Takaaki ManakaTokyo Institute of Technology, JapanSP1-4Colorimetric Probe Based on Destabilization of Silver Nanoparticles from Polysaccharide
 - Matrix for Creatinine Detection *Chutiparn Lertvachirapaiboon, Akira Baba, Kazunari Shinbo and Keizo Kato* Niigata University, Japan SP1-5 "Iontronics" —Electrochemistry of Biodevices— *Mitsuyoshi Onoda* Himeji City Fire Bureau, Japan

35

Special Planned Session 2: Innovative Functional Insulating Materials Development for Advanced Electric Power Apparatus – A Progressive Japanese Project

SP2-1	Innovative Functional Insulating Materials Development for Advanced Electric Power	42
	Apparatuses —Outline of NEDO Project	
	Masayuki Hikita	
	Kyushu Institute of Technology, Japan	
502.2	Dialactric Breakdown and Partial Discharge Properties of Nanocomposites for Epoxy/Mice	15

 SP2-2
 Dielectric Breakdown and Partial Discharge Properties of Nanocomposites for Epoxy/Mica
 45

 Insulation system in Large-size Rotating Machines
 45

	Hirotaka Muto	
	Mitsubishi Electric Corporation, Japan	
SP2-3	Impulse Flashover Characteristics of Cone-Type Insulating Spacer for GIS Fabrication Using	49
	Nano-micro Composites or Grading Functional Materials	
	Kenji Okamoto	
	Fuji Electric Co., Ltd., Japan	
SP2-4	3D Fluid Dynamic Simulation of Insulation Spacer with Graded Permittivity for GIS	53
	Yoshikazu Hoshina	
	Toshiba Energy Systems & Solutions Corporation, Japan	
SP2-5	Durability Test of Enamel Containing Nano-Cray under Artificial inverter Surge Condition for	57
	Medium and Small-Scale Generator	
	Nobutaka Fujimoto	
	Sumitomo Seika Chemicals Co., Ltd., Japan	
SP2-6	Measurement and Evaluation Techniques of Nanocomposites and Functionally Graded	61
	Materials for Advanced Electric Power Apparatus	
	Kazuo Adachi	
	Central Research Institute of Electric Power Industry, Japan	
Special P	lanned Session 3: Asset Management and Diagnosis for Electric Power Equipment	
SP3-1	An Analysis of Power Transformer Failures using the Mixed Weibull Statistics	65
	June-Ho LEE	
	Hoseo University, Korea	
SP3-2	Approach to Asset Management of Substation Equipment in Japan	68
	Nakamura Mitsuhiro (1), Tsukao Shigeyuki (2), Nakai Masao (3) and Miyashita Kouji (4)	
	(1) Chubu Electric Power Grid., Inc., Japan	
	(2) TEPCO Power Grid, Japan	
	(3) Kansai Transmission and Distribution, Inc., Japan	
	(4) Kyushu Electric Power Transmission and Distribution Co., Inc., Japan	
SP3-3	A Method to Calculate Uncertainty due to Unavailable Data in Transformer Assessment Index	72
	Rahman Azis Prasojo, Winanda Riga Tamma, Suwarno, Nur Ulfa Maulidevi and Bambang	
	Anggoro Soedjarno	
	Institut Teknologi Bandung, Indonesia	
SP3-4	Application of Cable Diagnosis in the Steel Industry	76
	Kazutoshi Yamawaki (1), Teppei Ueyama (1), Shinichi Ishida (2), Kenji Ushimaru (2) and	
	Yasuaki Nishioka (2)	
	(1) JFE Steel Co., Ltd., Japan	
	(2) Yokkaichi Denki Co., Ltd., Japan	
SP3-5	On-Line and Off-Line Partial Discharge Scouting on MV Networks	83
	Andrea Caprara, Giacomo Ciotti and Francesco Bartoloni	
	Techimp, Italy	

SP3-6	Investigation of Effects of Length and Width of Water Tree in 6.6 kV XLPE Cable on DC	87
	Leakage and AC Superposition Currents by Using Transient Electric Field Analysis	
	Takashi Kurihara (1), Hirotoshi Makino (2), Masafumi Yashima (2), Tomoyuki Sato (3),	
	Tsuyoshi Yurugi (4) and Manabu Sakata (3)	
	(1) Central Research institute of Electric Power Industry, Jaspan	
	(2) Tohoku University, Japan	
	(3) Tohoku Electric Power Co., Inc., Japan	
	(4) Tohoku Electric Power Network Co., Inc., Japan	
Collabor	ative Special Planned Session: Emerging Technologies for Next Generation Electrical	
Insulatin	ng Material and its Application	
CS-1	Strawberry Like Micro@nano Hybrid Filler for Thermally Conductive Epoxy Composites	91
	Xingyi Huang, Dexiao Zou and Pingkai Jiang	
	Shanghai Jiao Tong University, China	
CS-2	Analysis of Discharge Erosion Processes in Epoxy Silica Nanocomposite	95
	Keiko Koshiba (1), Tomonori Iizuka (1), Toshikatsu Tanaka (1), Kohei Tatsumi (1), Takahiro	
	Mabuchi (2), Xiaohong Yin (2), Takahiro Umemoto (2) and Hirotaka Muto (2)	
	(1) Waseda University, Japan	
	(2) Mitsubishi Electric Corporation, Japan	
CS-3	DC Breakdown Performances of EP/TiO ₂ Nanocomposites at Elevated Temperatures	99
	Dominated by Carrier Traps and Molecular Chain Dynamic	
	Zhen Li (1), Huan Niu (1), Shengtao Li (1), Daomin Min (1), Haoming Xu (1), Farooq Aslam (1)	
	and Ye Liu (2)	
	(1) Xi'an Jiaotong University, China	
	(2) State Grid Zhejiang Electric Power Co., Ltd., China	
CS-4	The Effect of Geraphene on the Thermal and Dielectric Properties of Epoxy Resin	103
	Hesham S. Karaman (1), Hanaa M. Ahmed (2), M. M. F. Darwish (1) and Diaa-Eldin A.	
	Mansour (3)	
	(1) Department of Electrical Engineering, Benha University, Egypt	
	(2) Department of Mathematics and Engineering Physics, Benha University, Egypt	
	(3) Tanta University, Egypt	
CS-5	Topology Optimization and 3D Printing: Toward a Functionally Graded Solid Insulator	107
	Muneaki Kurimoto	
	Nagoya University, Japan	
CS-6	Effect of Magnetic and Non-magnetic Nanoparticles on Insulation and Cooling Behaviour of a	111
	Natural Ester for Power Transformers	
	C. Méndez, I. Fernández, A. Ortiz, F. Ortiz, C. Olmo, A. Santisteban, F. Delgado and C.J. Renedo	
	University of Cantabria, Spain	
CS-7	Electrical Insulation at 800 V Electric Vehicles	115
	Davoud Esmaeil Moghadam, Christoph Herold and Rolf Zbinden	

	Von Roll Institute for High-Voltage Insulation, Switzerland	
CS-8	Aircraft Insulation Design for the More Electrical Aircraft: Challenges and Solutions	120
	Alberto Rumi and Andrea Cavallini	
	University of Bologna, Italy	
Session	n A: Space Charge Measurement and Simulation	
A-1	Thermal and Electrical Properties of EP/AlN Nanocomposites at Different Temperatures	124
	Chao Dai (1), Tie Jiang (1), Ashish Paramane (1), Xiangrong Chen (1) and Yasuhiro Tanaka (2)	
	(1) Zhejiang University, China	
	(2) Tokyo City University, Japan	
A-2	On the Temporal Variation of Boundary Fields and Non-uniform Distribution of Homocharges	128
	in LDPE	
	Avnish Kumar Upadhyay and C. C. Reddy	
	Indian Institute of Technology Ropar, India	
A-3	On the Delineation of Roles of Homocharge Conduction, Injection and Diffusion in LDPE	132
	Avnish Kumar Upadhyay and C. C. Reddy	
	Indian Institute of Technology Ropar, India	
A-4	Analysis of Pulsed-electroacoustic Signal Propagation Based on Viscoelastic Model	135
	Ryotaro Ozaki, Kizuki Ochi, Sota Sanda, Shinji Yudate and Kazunori Kadowaki	
	Ehime University, Japan	
A-5	Evaluation of Noise and DC Offset Voltage on Signal Processing for Space Charge	139
	Measurement of HVDC Cables	
	Shosuke Morita (1), Norikazu Fuse (1), Toshihiro Takahashi (1), Tsuguhiro Takahashi (1) and	
	Naohiro Hozumi (2)	
	(1) Central Research Institute of Electric Power Industry, Japan	
	(2) Toyohashi University of Technology, Japan	

Session B: Space Charge on Dielectric Interface and Simulation

- B-1 Simulation of Space Charge Distribution in the Insulation Layer of XLPE HVDC Cable under 143
 Different Temperatures *Yani Wang (1), Xingwu Yang (1), Aiqing Ma (1) and Yi Yin (2), (3)*(1) Shanghai University of Electric Power, China
 (2) Shanghai Jiao Tong University, China
 (3) Ministry of Education, China
 B-2 Effect of Silicone Grease Swelling with Corona Aging on the Interfacial Charge of XLPE/SR N/A
- Huanan Wang (1), Dong Yu (2) and Xia Wang (3)(1) Guangdong Power Grid Limited Liability Company Guangzhou Power Supply Bureau, China
 - (2) State Grid Fujian Fuzhou Electric Power Supply Company, China
 - (3) Xi'an Jiaotong University, China

B-3	Improved Interface Charge Transport Model of HVDC Cable Joint —Considering Carrier	151
	By name equinorium $H \subset Ligns(1) = P \setminus Div(1) = Z + Wans(2) = P \setminus Sons(2) = Z + Liv(2) + Liv(1) + Ang Liv(2)$	
	H. C. Llang (1), B. A. Du (1), Z. H. wang (2), F. A. Song (5), Z. J. Li (5), J. Li (1), Ang Li (2),	
	$\begin{array}{c} \text{A. Li} (5), \text{Z. Z. Meng} (5) \text{ and } 1. \text{ Iu} (5) \\ \text{(1) Tioniin University Chine} \end{array}$	
	(1) Hanjin University, China (2) Changemen Derver Sangla Companya State Crid Tierija Electric Derver Companya China	
	(2) Chengnan Power Supply Company, State Grid Hanjin Electric Power Company, China	
D 4	(3) Electric Power Research Institute, State Grid Hanjin Electric Power Company, China	1
B- 4	Effect of Laminating Direction on Space Charge and Conduction Current in Laminate	155
	Elastomet Sneets Shinishi Mitsumoto (1) Munoaki Kurimoto (2) Masayuki Euliii (2) Masumi Euluma (4) and	
	Lon A. Dissado (5)	
	(1) National Institute of Technology Toyota College Japan	
	(1) National institute of Technology, Toyota Conege, Japan (2) Nagoya University, Japan	
	(2) National Institute of Technology, Oshima College, Japan	
	(4) National Institute of Technology, Matsue College, Japan	
	(4) Iniversity of Leicester LIK	
B-5*	A Study on the Behavior of Interfacial Space Charge at Polymer Dielectric Double-I aver	158
D-3	Simulating the HVDC Cable Joints	150
	Yeong-Guk An Chul-Ho Kim Tae-Woo Nam and June-Ho Lee	
	Hoseo University. Korea	
	* Japan-Korea Young Researcher Exchange Program	
Sessio	n C: Application of Current Integrated Charge Method	
C-1	Parallel Measurements of Space Charge Distribution and Q (t)	162
	Masumi Fukuma (1) and Yoitsu Sekiguchi (2)	
	(1) National Institute of Technology, Matsue College, Japan	
	(2) Sumitomo Electric Industries, Ltd., Japan	
C-2	Conduction Phenomena of AC- and DC-XLPE Analyzed by Q(t) Method	166
	Yoitsu Sekiguchi, Kohei Hosomizu and Takanori Yamazaki	
	Sumitomo Electric Industries, Ltd., Japan	
C-3	Q(t)-measurements of Electrically Deteriorated Polymeric Materials Under Environmental	169
	Testing	
	Ryota Kitani and Shinya Iwata	
	Osaka Research Institute of industrial Science and Tecnology, Japan	
C-4	Space Charge Injection Behaviors in XLPE Composite Doped with Polycyclic Aromatic	173
	Compounds Using Q(t) Method and Quantum Chemical Calculation	
	J. Li (1), R. Y. Zhao (1), C. L. Han (1), Z. J. Li (2), P. X. Song (2), Y. Yu (2), X. Li (2),	
	Z. Z. Meng (2), B. X. Du (1) and T. Takada (3)	
	(1) Tianjin University, China	
	(2) State Grid Tianjin Electric Power Company, China	

(3) Tokyo City University, Japan

C-5

Study on Characteristics of Electrical Tree in Epoxy Resin Measured by Current Integrated 177 Charge Method

Masayuki Fujii (1), Koki Matsushita (2), Masumi Fukuma (3) and Shinichi Mitsumoto (4)

- (1) National Institute of Technology, Oshima College, Japan
- (2) Fuji Electric Co., Ltd., Japan
- (3) National Institute of Technology, Matsue College, Japan
- (4) National Institute of Technology Toyota College, Japan

Session D: Degradation Mechanism and Its Diagnostic Technologies I

- D-1 Partial Discharge Inception Voltage Characteristics at Low Frequencies: The Role of 181 Electrostatic Charges
 - P. Seri (1), G. Giovanetti (1), L. Zanotti (1), H. Santoso (2), A. Cavallini (1) and G. Mazzanti (1)
 - (1) University of Bologna, Italy
 - (2) Institut Teknologi Bandung, Indonesia
- D-2A Round-Robin Test Study of Partial Discharge Inception Voltage in Aeronautic Cables185T. Hähner (1), P. Rybsky (1), I. Cotton (2), R. Lowndes (2), L. Albert (3), C. Thomas (3),
 - S. Dinculescu (4) and G. Teyssedre (4)
 - (1) Nexans, France
 - (2) University of Manchester, UK
 - (3) IRT Saint Exupery, France
 - (4) Laplace, CNRS and University of Toulouse, France
- D-3 Detection Using Frequency Domain Reflectometry of the Permittivity Change in a Cable 190 Induced by the Exposure to Steam

Naoshi Hirai (1) and Yoshimichi Ohki (1), (2), (3)

- (1) Research Institute for Materials Science and Technology, Waseda University, Japan
- (2) Department of Electrical Engineering and Bioscience, Waseda University, Japan
- (3) Cooperative Major in Nuclear Energy, Waseda University, Japan

Session E: Degradation Mechanism and Its Diagnostic Technologies II

- E-1 Photographic Investigation of Repetitive Pulsed Discharge Light from Needle Electrode 194 Spraying Water Shinji Yudate, Shuhei Miyoshi, Ryosuke Tamada, Ryotaro Ozaki and Kazunori Kadowaki Ehime University, Japan
 E-2 Evaluation on Depth Profile of Surface Degradation of Polymeric Insulators by Microscopic 198 Observation of the Cross Section *Hiroya Homma (1), Koki Yonetake (2) and Manabu Sakata (2)* (1) Central Research Institute of Electric Power Industry, Japan (2) Tohoku Electric Power Co., Inc., Japan
- E-3 Research on Ultraviolet Aging Properties of Modified Silicone Rubber for Composite Insulator 202

	Peng Jing, Liu Zhiqiang, Wei Peng, Jing Qian, Wang Chunjie and Liu Yuxin	
	Xi'an High Voltage Apparatus Research Institute Co., Ltd., China	
E-4	Effect of Local Arc Discharge on Hydrophobicity Decrease of Silicone Rubber Surface	206
	Investigation on Hydrophobicity Change by Measuring Water Drop Velocity and Surface	
	Analysis—	
	Masahito Miyoshi, Hiroya Homma and Hisashi Goshima	
	Central Research Institute of Electric Power Industry, Japan	
Sessio	n F: Electrical Properties and Application of Dielectrics and Bio-dielectrics	
F-1	Dielectric Relaxation in Yttria-stabilized Zirconia Crystals	210
	Wencheng Wang (1), Peng Zhang (1), Xiufeng Li (1), Ping'an Li (1), Hao Zhang (2) and Lijuan	
	Zhang (3)	
	(1) Shandong University of Technology, China	
	(2) Xi'an University of Architecture and Technology, China	
	(3) State Grid Shandong Maintenance Company, China	
F-2	Influence of Internal Structure on Dielectric Breakdown Characteristics of Additive	213
	Manufacturing Parts Formed by Selective Laser Sintering	
	Hiroaki Arai, Yuki Yamauchi and Takeshi Ueno	
	Tokyo Metropolitan Industrial Technology Research Institute, Japan	
F-3	Ageing of Crepe Paper in Mineral Oil and Natural Ester	217
	Cristina Fernández-Diego, Alfredo Ortiz, Inmaculada Fernández, Carlos J. Renedo and	
	Fernando Delgado	
	University of Cantabria, Spain	
F-4	Pros and Cons of THz and Far-infrared Absorption Spectroscopy Compared to Mid-infrared	221
	Absorption Spectroscopy	
	Yoshimichi Ohki (1), (2), Tomofumi Seki (2) and Naoshi Hirai (1)	
	(1) Research Institute for Materials Science and Technology, Waseda University, Japan	
	(2) Department of Electrical Engineering and Bioscience, Waseda University, Japan	
F-5	Insulation Performance of Safety-Related Electrical Penetrations for Pressurized Water	225
	Reactors under Simulated Severe Accident Conditions	
	WATANABE Aiki (1), IKEDA Masaaki (1), MINAKAWA Takefumi (1), HIRAI Naoshi (2) and	
	OHKI Yoshimichi (2), (3), (4)	
	(1) Secretariat of Nuclear Regulation Authority, Japan	
	(2) Research Institute for Materials Science and Technology, Waseda University, Japan	
	(3) Department of Electrical Engineering and Bioscience, Waseda University, Japan	
	(4) Cooperative Major in Nuclear Energy, Waseda University, Japan	
F-6	Effect of High Current Pulses on Germinability of Radish Sprout Seeds	229
	Kazunori Kadowaki, Kyosuke Kamura, Oki Matsubayashi, Takumi Ikeda, Shinji Yudate and	
	Ryotaro Ozaki	
	Ehime University, Japan	

F-7 Insulation Design of the UHVDC Submarine Cable under the Background of Global Energy 233 Interconnection

Yao Liu (1), Xiaoling Zhao (1), Jiawei Wu (1), Jinyu Xiao (1), Yi Yin (2), (3), Hongliang Zhang (2), (3) and Yani Wang (4)

- (1) Global Energy Interconnection Development and Cooperation Organization, China
- (2) Shanghai Jiao Tong University, China
- (3) Ministry of Education, China
- (4) Shanghai University of Electric Power, China

Session G: Nanotechnology and Power Module Application

G-1	Surface Discharges and Flashover Voltages: Investigation of XLPE Samples with SiO ₂ and	237
	Al ₂ O ₃ Nanoparticles	
	K. Daskalopoulos (1), D. Verginadis (1), Y. Yin (2), M. G. Danikas (1) and R. Sarathi (3)	
	(1) Democritus University of Thrace, Greece	
	(2) Shanghai Jiao Tong University, China	
	(3) Indian Institute of Technology Madras, India	
G-2	Thermo-Mechanical Properties of LDPE/SiO ₂ Nanocomposites based on Chemically	241
	Functionalized SiO ₂ Nanoparticles	
	M. M. F. Darwish (1), Hanaa M. Ahmed (2) and Diaa-Eldin A. Mansour (3)	
	(1) Department of Electrical Engineering, Benha University, Egypt	
	(2) Department of Mathematics and Engineering Physics, Benha University, Egypt	
	(3) Tanta University, Egypt	
G-3	Dielectrophoretic Devices Fabricated by Proton Beam Writing for Concentration, Assembly,	245
	and Detection of Nanoparticles	
	Toshiki Kimura (1), Ryousuke Kawashima (2), Ken Yamamoto (2), Satoshi Uchida (2), Yasuyuki	
	Ishii (3) and Hiroyuki Nishikawa (1)	
	(1) Shibaura Institute of Technology, Japan	
	(2) Tokyo Metropolitan University, Japan	
	(3) National Institutes for Quantum and Radiological Science and Technology, Japan	
G-4	Study on Charge Distributions in Irradiated Insulation Materials of Power Electronics	249
	Yoshitaka Miyaji (1), Hirotaku Ishikawa (1), Kunihiko Tajiri (1), Hiroki Shiota (1), Kaisei Enoki	
	(2), Hiroaki Miyake (2) and Yasuhiro Tanaka (2)	
	(1) Mitsubishi Electric Corporation, Japan	
	(2) Tokyo City University, Japan	
G-5	The Impact of Impregnating Resins in Ensuring the Reliability Of Inverter-Fed Machines	253
	Alberto Rumi, Andrea Cavallini and Jacopo Marinelli	
	University of Bologna, Italy	
G-6	Carbonization Phenomena Dependence on Pressure between Insulation Sheets by Steeper	257
	Inverter Surge at Inverter Fed Motor	
	Yuichiro Yoshitake (1), Hiroaki Kojima (1), Yuki Kasai (2), Shoichi Maruyama (2), Hiroki	

Kojima (3) and Naoki Hayakawa (3)

- (1) Hitachi, Ltd., Japan
- (2) Hitachi Industrial Products, Ltd., Japan
- (3) Nagoya University, Japan

MVP Session A: Space Chage Behavior and Measurement I

VA-1	Effect of Quenching Treatment on Morphology and Properties of Eco-friendly Polypropylene	261
	Copolymer for Cable Insulation	
	Y. Liu (1), K. Yang (1), Y. Tian (2), Y.T. Liu (2), J.Y. Li (1) and Z.H. Jing (3)	
	(1) Xi'an Jiaotong University, China	
	(2) Electric Power Research Institute of Liaoning Power Grid Company Limited, China	
	(3) Sinopec Yanshan Petrochemical Company, China	
VA-2	Research on Conductivity Characteristics of Polypropylene under Extra High Electric Field	265
	Xi Zhu (1), Suman Peng (1), Jiandong Wu (1), (2) and Yi Yin (1), (2)	
	(1) Shanghai Jiao Tong University, China	
	(2) Ministry of Education, China	
VA-3	Space Charge and Conduction Current under DC High Stress in Modified Polypropylene	269
	Kouta Hashimoto (1), Natsumi Ohshima (1), Yasuhiro Tanaka (1), Hiroaki Miyake (1) and	
	Yoitsu Sekiguchi (2)	
	(1) Tokyo City University, Japan	
	(2) Sumitomo Electric Ind., Ltd., Japan	
VA-4	Effect of Thermal Aging on Dielectric Properties of XLPE Insulated HVDC Cable	273
	Jun Cao (1), Xi Zhu (1), Pengfei Su (1), Jiandong Wu (1), (2) and Yi Yin (1), (2)	
	(1) Shanghai Jiao Tong University, China	
	(2) Key Laboratory of Control of Power Transmission and Conversion, China	
VA-5	The Application of Signal Processing Using Dual Domain Deconvolution for New Space	277
	Charge Measurement Method in HVDC Full-Size Cables	
	Edo Bagus Prastika (1), Shafira Zahra (1), Xiaoxin Li (1), Yoshinobu Murakami (1), Tomohiro	
	Kawashima (1), Naohiro Hozumi (1) and Yoonhyoung Kim (2)	
	(1) Toyohashi University of Technology, Japan	
	(2) LS Cable & System Ltd., Korea	
VA-6	Effect of Mechanical Tensile on Nonlinear Conductivity of Silicon Carbide/Silicone Rubber	281
	Composites for Prefabricated Joint of HVDC Cable	
	Chong Han (1), Boxue Du (1), Zhonglei Li (1) and Zhuoran Yang (2)	
	(1) Tianjin University, China	
	(2) State Grid Nanjing Power Supply Company, China	
VA-7	Proposal of Calibration Method for Space Charge Distribution in Laminated Films Using PEA	285
	Measurement System	
	Naoki Kirigaya, Kumiko Iguchi, Hiroaki Miyake and Yasuhiro Tanaka	
	Tokyo City University, Japan	

MVP Session B: Space Chage Behavior and Measurement ${\rm I\!I}$

VB-1	A New Method of Measuring Electron-hole Pairs with the PEA Method Just after Electron Irradiation	289
	Kazuki Endo, Kaisei Enoki, Hiroaki Miyake and Yasuhiro Tanaka	
	Tokyo City University. Japan	
VB-2	Development of Pulsed Electro-acoustic Measurement System with High Positional Resolution	293
	at High Temperature using P(VDF/TrFE) Thin Film	
	Hironori Aoki (1), Yoshitaka Noiiri (2), Kaisei Enoki (1), Hiroaki Mivake (1), Yasuhiro Tanaka (1)	
	and Hiroyuki Nishikawa (2)	
	(1) Tokyo City University, Japan	
	(2) Shibaura Institute of Technology, Japan	
VB-3	Improved Method for Evaluation of Dielectric Breakdown Strength of Epoxy / Silica	297
	Nanocomposite Thin Films	
	Yusuke Kida (1), Rina Sankawa (1), Kohei Takahashi (1), Shuhei Yamamoto (1), Takanobu	
	Watanabe (1), Kotaro Mura (2), Yoshihiro Ohgashi (2), Tetsuo Yoshimitsu (2) and Takahiro Imai (3)	
	(1) Waseda University, Japan	
	(2) Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan	
	(3) Toshiba Infrastructure Systems & Solutions Corporation, Japan	
VB-4	The Analysis of Electrical Properties of Modified Graphene Oxide/Epoxy Composites	301
	Beibei Jia, Yongfei Li, Jun Zhou and Kai Wu	
	Xi'an Jiaotong University, China	
VB-5	Study of Asymmetrical Leakage Currents of Metal Oxide Surge Arrester due to Multiple	305
	Current Impulses	
	C. Chuayin (1), M. Zinck (2), A. Kunakorn (1) and N. Pattanadech (1)	
	(1) King Mongkut's Institute of Technology Ladkrabang, Thailand	
	(2) Paralec Energy Co., Ltd., Thailand	
VB-6	Study on Space Charge Behavior in DC Model Cable under Thermal Gradient and Polarity Reversal	309
	D. Irvandy (1), H.H. Duong (2), G. Teyssedre (2), L. Berquez (2), I. Sinisuka (3) and T.T.N. Vu (4)	
	(1) Pt. PLN, Indonesia	
	(2) Laplace, CNRS and University of Toulouse, France	
	(3) Bandung Institute of Technology, Indonesia	
	(4) Electric Power University, Vietnam	
VB-7	A Study on Space Charge Behavior in Double-layer Dielectrics for Eco-friendly Power Cable Joint	313
	Chul-Ho Kim, Tae-Woo Nam, Yeong-Guk An, Quang Ho and June-Ho Lee	
	Hoseo University, Korea	

MVP Session C: Space Chage Behavior and Measurement III

VC-1 Prediction of the Space Charge Related Maximum Electric Field of XLPE Insulation by Sparse 317
 Bayesian Learning
 Xinyuan Li, Weiwang Wang, Zhiqiang Guo, Wen Bu and Shengtao Li

Xi'an Jiaotong University, China

VC-2	Study on the Difference of Space Charge Distribution in EPDM under DC and AC Electric	321
	Fields	
	Linxin Miao (1), Jiandong Wu (1), (2), Yi Yin (1), (2) and Jun Cao (1)	
	(1) Shanghai Jiao Tong University, China	
	(2) Key Laboratory of Control of Power Transmission and Conversion, China	
VC-3	Charge Behavior Measurement near the Interface Parallel to the Electric Field	325
	Junichi Hoshi (1), Kazuya Sakamoto (1), Tomohiro Kawashima (1), Naohiro Hozumi (1),	
	Yoshinobu Murakami (1), Hiroki Shiota (2) and Kazutake Kadowaki (2)	
	(1) Toyohashi University of Technology, Japan	
	(2) Mitsubishi Electric Corporation, Japan	
VC-4	Numerical Simulation of Transient Behavior of Packet-Like Space Charge in Low Density	327
	Polyethylene	
	Kazuya Takeda, Shinji Yudate, Ryotaro Ozaki and Kazunori Kadowaki	
	Ehime University, Japan	
VC-5	Current Reduction Caused by Strong Local Field in Low-Density Polyethylene under Various	331
	Temperatures	
	Takahiro Mihara, Shinji Yudate, Ryotaro Ozaki and Kazunoroi Kadowaki	
	Ehime University, Japan	
VC-6	Investigation of the Effect of DC Voltage Increasing Rate on Space Charge Distribution and	335
	Dielectric Breakdown in Low Density Polyethylene	
	Koki Morikawa, Kotaro Ogura, Hiroaki Miyake and Yasuhiro Tanaka	
	Tokyo City University, Japan	
VC-7	Special Behaviors of Space Charge inside Insulating Materials under Different Polarization	339
	Conditions	
	Hanwen Ren (1), Yasuhiro Tanaka (2), Haoyu Gao (1), Chengqian Li (1) and Qingmin Li (1)	
	(1) North China Electric Power University, China	
	(2) Tokyo City University, Japan	
MVP Se	ession D: Liquid Dielectrics and Their Application	

VD-1 Investigation of the Effect of Silver Sulfide on the Dielectric Properties of Mixed Insulating Liquid 343
A. J. Amalanathan (1), R. Sarathi (1), Noureddine Harid (2) and Huw Griffiths (2)
(1) Indian Institute of Technology Madras, India
(2) Khalifa University, UAE
VD-2 Statistical Analysis of Natural Ester based Insulating Liquid using Hypothesis Testing 347
Niharika Baruah (1), Rohith Sangineni (1), Manas Chakraborty (2) and Sisir Kumar Nayak (1)
(1) Indian Institute of Technology Guwahati, India
(2) Central Power Research Institute, India
VD-3 Space Charge Behavior of Oil-paper Insulation in Transformer under AC Fields 351

Guiyue Zhou (1), Yi Yin (1), (2), Jiandong Wu (1), (2), Lu Che (1), Qiaohua Wang (1), (2),

Zhihao Wang (1), (2) and Yue Hu (1), (2)(1) Shanghai Jiao Tong University, China(2) Ministry of Education, China

- VD-4 Contributions of Ionization and Injection to Charge Transportation in Oil-paper Insulation 355
 Yang Wu, Kai Wu, Rui Su, Yifei He, Jiaxin Chen and Zengpeng Lv Xi'an Jiaotong University, China
- VD-5 Effect of Moisture on Space Charge Characteristics of Oil-paper Insulation under AC-DC 359 Electric Field
 Lu Che (1), Jiandong Wu (1), (2), Yi Yin (1), (2), Guiyue Zhou (1) and Qiaohua Wang (1), (2) (1) School of Electronic Information and Electrical Engineering, China (2) Ministry of Education, China
- VD-6 Partial Discharge Characteristics of Mineral Oil Immersed Transformer Compared with Natural 363
 Ester and Palm Oil Immersed Transformer under Different Periods of Impregnation
 Sakda Maneerot and Norasage Pattanadech
 King Mongkut's Institute of Technology, Thailand
- VD-7
 Effect of Catalyst on Dielectric Breakdown Characteristics of Esterified Rice Oil
 367

 Hiroki Nagai, Yuichi Murakami and Yuji Muramoto
 Meijo University, Japan
- VD-8 Addition Effect of Nitrogen Fine Bubbles and Nonionic Polymer Surfactant to Pure Wateron 371
 Resistivity and Negative Lightning Impulse BreakdownVoltageof Pure Water
 Masaki Miyama, Norimitsu Takamura, Nobutaka Araoka and Masahiro Hanai
 Fukuoka University, Japan

MVP Session E: Nanocomposites I

VE-1	Study on the Dielectric Performance of XLPE Nanocomposite against the Electrical Tree		
	Propagation		
	N. S. Mansor (1), N. S. M Nazar, D. Ishak (1), M. Mariatti (2), H. S. A. Halim (3), A. B. A. Basri		
	(3) and M. Kamarol (1)		
	(1) School of Electrical and Electronic Engineering, Universiti Sains Malaysia, Malaysia		
	(2) School of Material and Mineral Resources Engineering, Universiti Sains Malaysia, Malaysia		
	(3) TNB Research, Malaysia		
VE-2	Partial Discharge Activity of Al_2O_3 Nanofluid Impregnated Paper Insulation System	379	
	Eman G. Atiya (1), Diaa-Eldin A. Mansour (1) and Mohamed A. Izzularab (2)		
	(1) Department of Electrical Power and Machines Engineering Faculty of Engineering, Egypt		
	(2) Minoufiya University Shebin El-Kom, Egypt		
VE-3	Space Charge and Breakdown Characteristics of XLPE/BNNSs Nanocomposites	383	
	Guochang Li (1), Xuguang Zhou (1), Guoqiang Su (2), Yanhui Wei (1), Chuncheng Hao (1) and		

Qingquan Lei (1)

(1) Qingdao University of Science and Technology, China

	(2) Grid Shandong Electric Power Research Institute, China	
VE-4	Effect of Interphase on the Space Charge Performance of Al-Epoxy Nanocomposites	387
	Chillu Naresh (1), Ramanujam Sarathi (1) and Rengaswamy Jayaganthan (2)	
	(1) Department of Electrical Engineering, Indian Institute of Technology Madras, India	
	(2) Department of Engineering Design, Indian Institute of Technology Madras, India	
VE-5	Impact of Ultraviolet Irradiation on Space Charge Dynamics and Surface Properties of Epoxy	391
	Micro-Nano Composites	
	Myneni Sukesh Babu (1), Ramanujam Sarathi (1) and Takahiro Imai (2)	
	(1) Indian Institute of Technology Madras, India	
	(2) Toshiba Corporation, Japan	
VE-6	The Influence of Water Aging on Dielectric and Space Charge Behaviour of MgO filled Epoxy	395
	Nanocomposites	
	Nagaraju G and Sarathi R	
	Indian Institute of Technology Madras, India	
VE-7	DC Insulation Properties of Commercial Grade 320 kV HVDC XLPE/MgO Nanocomposite	399
	Material	
	Ashish Paramane (1), Dai Chao (1), Linwei Yu, Xiangrong Chen (1) and Yasuhiro Tanaka (2)	
	(1) Zhejiang University, China	
	(2) Tokyo City University, Japan	

MVP Session F: Nanocomposites II

VF-1	Surface Modification of Nano-BaTiO ₃ by Perfluorosilane Coupling Agent and its Effects on	403
	Dielectric Properties of High-k Photosensitive Composites	
	Zhi-Hui Jiang, Wen-Dong Li, Xiong Yang, Chao Wang, Ming-Yu Chen and Guan-Jun Zhang	
	Xi'an Jiaotong University, China	
VF-2	Temperature-dependent Electrical and Thermal Characteristics of tpPI/h-BN Composite	407
	Insulating Material Using Electrostatic Adsorption Method	
	Takeru Tachibana, Kosei Kikuike, Tomohiro Kawashima, Naohiro Hozumi and Yoshinobu	
	Murakami	
	Toyohashi University of Technology, Japan	
VF-3	Understanding the Electrical and Mechanical Properties of Epoxy Alumina Nanocomposites	410
	Neelmani (1), Hisayuki Suematsu (2) and Ramanujam Sarathi (1)	
	(1) Indian Institute of Technology Madras, India	
	(2) Nagaoka University of Technology, Japan	
VF-4	Investigating the Characteristic Properties of Epoxy Nickel Nanocomposites	414
	Amizhtan S K (1), M.G. Danikas (2) and R. Sarathi (1)	
	(1) Indian Institute of Technology Madras, India	
	(2) Democritus University of Thrace, Greece	
VF-5	Dielectric Breakdown Characteristic of Refining Treatment Fullerene Doped Epoxy Plate-like	418
	Specimens	

	Kristiawan Agung Satria (1), (2), (3), Kotaro Ozuno (1), Yoshiyuki Inoue (1), Masahiro Kozako (1),	
	Masayuki Hikita (1), Suwarno (3), Umar Khayam (3), Takeshi Igarashi (4) and Hiroaki Kaji (4)	
	(1) Kyushu Institute of Technology, Japan	
	(2) PT. PLN, Indonesia	
	(3) Institut Teknologi Bandung, Indonesia	
	(4) Showa Denko K. K., Japan	
VF-6	Electric Field Grading by Permittivity and Conductivity Graded Materials ($\epsilon/\sigma\text{-}FGM)$ for	421
	HVDC Gas Insulated Power Apparatus	
	Rachmawati (1), Atsuhiro Izu (1), Ryuichi Nakane (1), Hiroki Kojima (1), Katsumi Kato (2),	
	Nabila Zebouchi (3) and Naoki Hayakawa (1)	
	(1) Nagoya University, Japan	
	(2) National Institute of Technology, Niihama College, Japan	
	(3) Cardiff University, UK	
VF-7	Effect of Oxygen Vacancy on the Electronic Structure and Electrical Properties of HfO_2/Si	425
	Interface	
	Jiachi Yao (1), Guanghao Qu (1), Zhonghua Zhao (1), Guowei Zhang (2), Daomin Min (1), Jie	
	Liu (3) and Shengtao Li (1)	
	(1) Xi'an Jiaotong University, China	
	(2) Northwest Institute of Nuclear Technology, China	
	(3) Chinese Academy of Sciences, China	
VF-8	Quantum Chemical Calculation Analysis of Electric Charge Trap Site in Epoxy Resin Cured	429
	Using Novel Imide Type Hardener	
	Kosuke Sato (1), Hiroaki Miyake (1), Yasuhiro Tanaka (1) and Ayumi Yanaka (2)	
	(1) Tokyo City University, Japan	
	(2) UNITIKA Ltd., Japan	

MVP Session G: Bio and Organic Dielectrics

 VG-1 Rice Types Classification by Using Dielectric Properties Measurement with Saline Water 433 Increasing Technique
 Wittawat Wasusathien, Samran Santalunai, Thanaset Thosdeekoraphat and Chanchai Thongsopa Suranaree University of Technology, Thailand
 VG-2 Dielectric Property Measurement of Freshwater Fishes and Parasite Affecting Infection 439

Opisthorchis Viverrini for Dielectric Heating Application Supatinee Kornsing, Samran Santalunai, Thanaset Thosdeekoraphat and Chanchai Thongsopa Suranaree University of Technology, Thailand

VG-3 Effect of Ethanol Concentration on *Escherichia coli* and *Saccharomyces cerevisiae* Sterilization 443
 by High Electric Field Pulse Application
 Masaki Takamori, Yuichi Murakami and Yuji Muramoto Meijo University, Japan

VG-4 Micro-structuring of PVDF-TrFE by Proton Beam Writing for Tactile Sensors 447 Yoshitaka Nojiri (1), Hidetaka Hayashi (2), Yasuyuki Ishii (3) and Hiroyuki Nishikawa (1) (1) Shibaura Institute of Technology, Japan (2) Eco-design Promotion Network, Japan (3) National Institutes for Quantum and Radiological Science and Technology, Japan VG-5 Tuning the Luminescent Intensity by Controlling the Distance between Gold Quantum Dots 451 and Silver Nanoprisms Wataru Sato, Chutiparn Lertvachirapaiboon, Akira Baba, Kazunari Shinbo and Keizo Kato Niigata University, Japan VG-6 Analysis of the Emitted Frequency Spectra of Breakdowns in SF_6 Gas as well as in Alternative 454 Insulating Gases for Gas Insulated Systems Johannes Wiener (1), Volker Hinrichsen (1), Felix Goll (2) and Karsten Juhre (1) (1) Technical University Darmstadt, Germany (2) Siemens Energy, Germany

MVP Session H: Power Module Application

VH-1	Electrical Tree Propagation in Epoxy Resin under Bipolar Square Wave Field with Varied 45		
	Frequencies		
	Chuang Zhang, Hang Fu, Jiao Xiang, Zhuolin Cheng, Shihang Wang and Jianying Li		
	Xi'an Jiaotong University, China		
VH-2	Influence of High Frequency Voltage with Harmonic Contents and Temperature on Breakdown	462	
	of Epoxy Resin Used in Power Electronic Transformer		
	Xin Wang, Weiwang Wang, Ying Liu, Jiefeng He and Shengtao Li		
	Xi'an Jiaotong University, Japan		
VH-3	Research on Partial Discharge Detection Technique under Square Wave	466	
	Yi Ding (1), (2), Wenyi Li (1), (2), Yalin Wang (1), (2), Jiandong Wu (1), (2) and Yi Yin (1), (2)		
	(1) Shanghai Jiao Tong University, China		
	(2) Key Laboratory of Control of Power Transmission and Conversion, China		
VH-4	Nondestructive Fault Localization of Semiconductor Devices with Ultrasound Heating	470	
	Takuto Matsui (1), Hayato Hayashi (1), Tomohiro Kawashima (1), Yoshinobu Murakami (1),		
	Naohiro Hozumi (1) and Toru Matsumoto (2)		
	(1) Toyohashi University of Technology, Japan		
	(2) Hamamatsu Photonics K.K., Japan		
VH-5	Electric Field Strength and Tree Propagation Speed for Electrical Treeing in Silicone Gel	474	
	Wataru Yabuuchi, Ayaka Wada, Sinpei Sasaki, Yu Kawai, Jeon Hyeon-Gu, Masaharu Fujii and		
	Haruo Ihori		
	Ehime University, Japan		

MVP Session I: Dielectric Phenomena on Dielectric Surface and Outdoor Insulation

VI-1	Optimization of the Superhydrophobic Insulation Longevity Covered with Water Drops under	478
	DC Voltage	
	K. Hamour (1), F. Bouchelga (1), R. Boudissa (1) and S. Kornhuber (2)	
	(1) University A. Mira of Bejaia, Algeria	
	(2) University of Applied Sciences Zittau/Görlitz, Germany)	
VI-2	Understanding the Space Charge variation in Silicone rubber with different Low Molecular	482
	Weight Siloxanes	
	Pabbati Vinod (1), Ramanujam Sarathi (1) and Stefan Kornhuber (2)	
	(1) Indian Institute of Technology Madras, India	
	(2) University of Applied Sciences Zittau/Görlitz, Germany	
VI-3	Surface and Internal Charge Measurement in Fluorinated Polymer Irradiated by Electron Using	486
	Non-contact Type PEA Method Measurement Apparatus	
	Kaisei Enoki, Kazuki Endo, Hiroaki Miyake and Yasuhiro Tanaka	
	Tokyo City University, Japan	
VI-4	The Study of Surface Flashover Affected by Corona Discharging via Non-invasive Surface	490
	Potential Measurement	
	Lu Fan, Yifan Rui, Yalin Wang and Yi Yin	
	Shanghai Jiao Tong University, China	
VI-5	Conductivity Distribution in Air by Charging Process on Solid Dielectrics under DC Voltage	494
	Ryuichi Nakane (1), Hiroki Kojima (1), Naoki Hayakawa (1) and Hitoshi Okubo (2)	
	(1) Nagoya University, Japan	
	(2) Aichi Institute of Technology, Japan	
VI-6	Surface Voltage Measurement of XLPE Insulated Covered Overhead Conductor	498
	Ajith John Thomas, Iyyappan. C and C.C. Reddy	
	Indian Institute of Technology Ropar, India	
MVP Se	ession J: Partial Discharge, Degradation Mechanism and Diagnostic Technologies I	
VJ-1	Influence of Thermal Ageing on the Optical Performance of XLPE Cable Insulation	502

VJ-1 Influence of Thermal Ageing on the Optical Performance of XLPE Cable Insulation
Xian Yang (1), Yuanyuan Zhang (2), Hongming He (1), Manshi Qiu (2), Xin Yu (1) and Jianying
Li (2)
(1) Fluctic Proceedings of Constant Proceedings of Constant Proceedings

 $(1) \ Electric \ Power \ Research \ Institute \ of \ Guangdong \ Power \ Grid \ Corporation, \ Chinam$

(2) Xi'an Jiaotong University, China

- VJ-2 Observation and Modeling of Water Tree in 60 kV-class XLPE Cable –Investigation of AC 506 Loss Current and Electric Field Using Transient Electric Field Analytical Model– Tetsuya Hara (1), Koudai Itagaki (1), Masafumi Yashima (1), Takashi Kurihara (2) and Toshihiro Takahashi (1)
 - (1) Tohoku University, Japan

(2) Central Research institute of Electric Power Industry, Japan

VJ-3	Evaluation of Change in Bow-tie Tree Degradation Due to Additional Voltage Application by		
	Image Processing		
	Takeshi Ishiguro (1), Yuta Shimoda (1), Yasuo Suzuoki (1), Fumitaka Komori (2), Muneaki		
	Kurimoto (3) and Takeyoshi Kato (3)		
	(1) Aichi Institute of Technology, Japan		
	(2) NIT, Toba College, Japan		
	(3) Nagoya University, Japan		
VJ-4	Microwave Detection Technology for Internal Defects of Composite Post Insulators	513	
	Huaiyuan Jiang (1), Hongwei Mei (1), Xiaobing Zou (2), Lanxin Li (1) and Liming Wang (1)		
	(1) Tsinghua Shenzhen International Graduate School, Tsinghua University, China		
	(2) Department of Engineering, Tsinghua University, China		
VJ-5	Effect of Background Noise Discrimination on Partial Discharge Pattern Recognition Using	517	
	Neural Network and Support Vector Machine		
	Beom An (1), Sungho Yoon (1), Sanggoon Lee (1), Jeongtae Kim (1), Yeonha Jung (2) and		
	Taein Jang (2)		
	(1) Daejin University, Korea		
	(2) KEPCO Research Institute, Korea		
VJ-6	A Novel On-Line Monitoring System for Diagnostics Parameters of EHV GIS Electrical	520	
	Apparatuses of Transmission Networks		
	Andrea Caprara, Giacomo Ciotti and Mirko Melloni		
	Techimp, Italy		
VJ-7	Proposal of Noise Rejection in Automatic Measurement System of Repetitive Partial Discharge	522	
	Inception Voltage		
	Yasutaka Nishigaki (1), Sho Takenouchi (1), Masahiro Kozako (1), Masayuki Hikita (1),		
	Takahiro Nakamura (2), Jintong Sun (2), Aoto Izumi (2), Takayuki Sakurai (2), Kazunari		
	Karasawa (2) and Tatsuya Hirose (3)		
	(1) Kyushu Institute of Technology, Japan		
	(2) Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan		
	(3) Toshiba Infrastructure Systems & Solutions Co., Ltd., Japan		
VJ-8	Optimization of Partial Discharge Detection Sensitivity of Transient Earth Voltage Sensors	525	
	Using FDTD Modeling		
	Satya Hari Wibowo (1), (2), (3), Umar Khayam (2), Suwarno (2), Yasutomo Kakimoto (3),		
	Masahiro Kozako (3) and Masayuki Hikita (3)		
	(1) PT PLN, Indonesia		
	(2) Institut Teknologi Bandung, Indonesia		
	(3) Kyushu Institute of Technology, Japan		

MVP Session K: Partial Discharge, Degradation Mechanism and Diagnostic Technologies II

VK-1 Effect of Impurity Bridges on Breakdown Strength of PFAE under Lightning Impulse Stress 529 S. Saaidon (1), (2) and M.Kamarol (1)

(1) Universiti	Sains	Malaysia,	Malaysia
() =			

- (2) Centre of Instructor and Advanced Skills Training, Malaysia
- VK-2 Breakdown Characteristics of Cone-type ε-FGM Spacer for Gas Insulated Switchgears 533 *Yusaku Miyazaki (1), Atsuhiro Izu (1), Zhaoyuan Liang (1), Hiroki Kojima (1), Hidetaka Masui (2), Hiroshi Mitsudome (2), Hironori Yanase (2), Kenji Okamoto (2), Keiji Watanabe (3), Katsumi Kato (4) and Naoki Hayakawa (1)
 (1) Nagoya University, Japan
 (2) Fuji Electric Co., Ltd., Japan
 (3) Nagase ChemteX Co., Ltd., Japan*
 - (4) National Institute of Technology, Niihama College, Japan
- VK-3 The Breakdown Characteristics of Oil-Paper Insulation in Converter Transformers 537
 Kun Zuo (1), Wei Shen (2), Huize Cui (3), Guangming Zhou (3), Weiwang Wang (3) and Shengtao Li (3)
 - (1) Shaanxi Electric Power Corporation, China
 - (2) Shaanxi Electric Power Research Institute, Shaanxi Electric Power Corporation, China
 - (3) Xi'an Jiaotong University, China
- VK-4 Investigating the Internal Winding Resonance Characteristics of Various Power Transformer 541 Winding Designs
 - Sriyono (1), Suwarno (2) and Umar Khayam (2)
 - (1) PT PLN, Indonesia
 - (2) Institut Teknologi Bandung, Indonesia
- VK-5 Study on The Influence of Surface State of Copper Conductor of Oil-immersed Power 545 Transformer on Sulfur Corrosion
 Dong Ding (1), Lijun Yang (1), Yuan Yuan (2), Sihang Gao (3) and Yuncai Lu (4)
 - State Key Laboratory of Power Transmission Equipment and System Security and New Technology, Chongqing University, China
 - (2) College of Material Science and Engineering, Chongqing University, China
 - (3) Chongqing University of Posts and Telecommunications, China
 - (4) State Grid Jiangsu Electric Power Co., Ltd., China
- VK-6
 Effect of Pre-heating on AC Breakdown Strength of Oil Barrier Tube
 549

 G Nithin Reddy and C. C. Reddy
 Indian Institute of Technology Ropar, India
- VK-7 Comparison between Positive and Negative Corona Discharges by Hydrodynamic Plasma 552
 Simulations
 Calvin ZOGNING, Jacques LOBRY and Francis MOINY
 University of Mons, Belgium

MVP Session L: Partial Discharge, Degradation Mechanism and Diagnostic Technologies III

VL-1 Characteristics of Partial Discharge in XLPE during Electrical Tree Initiation Process under 561 Different Temperatures Suman Peng (1), Xi Zhu (1), Jiandong Wu (1), (2) and Yi Yin (1), (2)
(1) Shanghai Jiao Tong University, China
(2) Ministry of Education, China

- VL-2
 Investigation of Partial Discharge Activity in the Slot of a Hairpin-wound Stator
 565

 Chuxuan He, Chandra Prakash Beur and Stefan Tenbohlen University of Stuttgart, Germany
- VL-3 Study on the Relation between PD Characteristics and Degradation of PP Films for Power 569 Capacitors by Utilizing Artificially Formed Through Holes
 Naoki Matsuda (1), Yasuo Suzuoki (1), Yudai Takemoto (2), Muneaki Kurimoto (2), Takeyoshi Kato (2), Fumitaka Komori (3), Yuya Sano (4), Shinkichi Hamada (4), Shintaro Ogura (4) and Yukio Sasatani (4)
 (1) Aichi Institute of Technology, Japan
 - (2) Nagoya University, Japan
 - (3) NIT Toba College
 - (4) NISSIN ELECTRIC Co., Ltd., Japan
- VL-4 Assessment of Charge Behavior in Electrical Tree Tube Based on Characteristics of Partial 572
 Discharge Waveform
 Nobuyuki Takeda, Tomohiro Kawashima, Yoshinobu Murakami and Naohiro Hozumi
 - Toyohashi University of Technology
- VL-5 Comparison of Partial Discharge Activity in Mineral Oil and PFAE Containing Multiple 576 Spherical Metal Particles
 - Kiasatina Azmi (1), Dahaman Ishak (1), Nor Asiah Muhamad (1), Ahmad Zuhairi (2), Umar Khayam (3) and Mohamad Kamarol (1)
 - (1) School of Electrical and Electronic Engineering, Universiti Sains Malaysia, Malaysia
 - (2) School of Chemical Engineering, Universiti Sains Malaysia, Malaysia
 - (3) Institut Teknologi Bandung, Indonesia
- VL-6 Examination of Impulse PD Inception Location by Electric Field Analysis in Ester Oil/ 580
 Pressboard Composite Insulation System
 Taichi Yamada (1), Masahiro Kozako (1), Masayuki Hikita (1), Shigeyoshi Yoshida (2), Haruki
 Hamada (2) and Takahiro Umemoto (2)

(1) Kyushu Institute of Technology, Japan

(2) Mitsubishi Electric Corporation, Japan

- VL-7 Discharge Inception Characteristics Analysis of Epoxy/Silica Nanocomposites in SF₆ Gas 584 Using Volume-time Theory Yoshiyuki Inoue (1), Kotaro Ohzuno (1), Masahiro Kozako (1), Masayuki Hikita (1), Hidetaka Masui (2), Hiroshi Mitsudome (2), Hironori Yanase (2) and Kenji Okamoto (2) (1) Kyushu Institute of Technology, Japan (2) Fuji electric Co., Ltd., Japan
- VL-8 Aging Behavior of Soft and Hard Epoxy Resins in Simulated Nuclear-Power-Plant Environments 587
 Hiroyuki Ishii (1), Naoshi Hirai (2) and Yoshimichi Ohki (1), (2)

(1) Department of Electrical Engineering and Bioscience, Waseda University, Japan

(2) Research Institute for Materials Science and Technology, Waseda University, Japan

Sun Shine (Industry) Session

SS-1	Partial Discharge Test Equipment —Digital Impulse Winding Tester with Micro Wave PD	N/A
	Sensor DWX-xxPD	
	Kiyoshi Umezu, Akira Takeshita and Rina Nishizono	
	ECG KOKUSAI Co., Ltd., Japan	
SS-2	Introduction of Tuning Type Partial Discharge Detector that Adopts Very Narrow-band Method	N/A
	Ryuya Asagi, Takuya Tomizawa, Takeshi Ato and Terutsugu Tsunekage	
	Fujikura Dia Cable Ltd., Japan	
SS-3	On-line Partial Discharge Monitoring/Diagnosis System	N/A
	Sadayuki Kanazawa, Yasuhiro Nakayama, Singo Kase, Ryosuke Shinoki, Taku Sato, and Yuto	
	Yamamoto	
	SOKEN ELECTRIC Co., Ltd., Japan	
SS-4	Tank Vibration Analysis of Extra-High-Voltage Transformer	N/A
	Yoshinori Konishi (1), Masamichi Kato (1), Masayuki Hasegawa (1), Hikaru Aoyama (2) and	
	Satoshi Matsumoto (3)	
	(1) Yuka Industries Co., Ltd., Japan	
	(2) East Japan Railway Company, Japan	
	(3) Shibaura Institute of Technology, Japan	
SS-5	Rise Time Measurement of PWM Waveform during No-load Operation of Inverter-fed Motor	N/A
	Takahiro Nakamura, Hayato Furukawa, Jintong Sun, Aoto Izumi and Kazunari Karasawa	
	Toshiba Mitsubishi-Electric Industry Systems Corporation, Japan	
SS-6	Observation of Electrical Tree in Mica/Epoxy Nano-composite Insulation	N/A
	Hiromitsu Hirai (1), Takahiro Imai (1), Kotaro Mura (2), Yu Yamashita (2) and Tetsuo Yoshimitsu (2)	
	(1) Toshiba Infrastructure Systems & Solutions Corporation, Japan	
	(2) Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan	
SS-7	Study on Combined Environmental Stress Insulation for Creepage Structures	N/A
	HAYASE Yuji, SUZUKI Haruka and YAMASHIRO Keisuke	
	Fuji Electric Co., Ltd., Japan	
SS-8	New Accelerated Ageing Test for Polymer Insulators	N/A
	Takanori Kondo (1), Ryo Inoue1 and Kevin Edmonds (2)	
	(1) NGK INSULATORS, Ltd., Japan	
	(2) NGK-LOCKE, Inc, USA	

Digest Report from Cooperative Research Committee and Investigating R&D Committees

DR-1 Digest Report of Investigating R&D Committee on Insulation Diagnosis Technologies for N/A
 Electric Power Apparatus and Equipment Using New and Practicable Insulation Materials
 Yoshiyasu Ehara (1) and Takashi Kurihara (2)

(1) Tokyo City University, Japan

(2) Central Research Institute of Electric Power Industry, Japan DR-2 Digest Report of Investigating R&D Committee on Advancing Tailor-made Composite N/A Insulation Materials and Their Applications Takahiro Imai (1), Muneaki Kurimoto (2), Hideki Misaka (3) and Ryotaro Shimada (4) (1) Toshiba Infrastructure Systems & Solutions Corporation, Japan (2) Nagoya University, Japan (3) Central Research Institute of Electric Power Industry, Japan (4) Hitachi, Ltd., Japan DR-3 Digest Report of Investigating R&D Committee on Information for Asset Management of N/A Electric Power Apparatus Based on Insulation Deterioration Katsumi Uchida (1), Kiyoka Suenaga (2) and Yuta Makino (3) (1) Chubu Electric Power Co., Inc., Japan (2) JFE Advantech Co, Ltd., Japan (3) Central Research Institute of Electric Power Industry, Japan DR-4 Digest Report of Investigating R&D Committee on Electrical Insulation Reliability of Power N/A Modules Masahiro Kozako (1), Naoya Kishi (2) and Yuji Hayase (3) (1) Kyushu Institute of Technology, Japan (2) Zeon Corporation, Japan (3) Fuji Electric Co., Ltd., Japan DR-5 Digest Report of Investigating R&D Committee on Application of Quantum Chemical N/A Calculations in the Field of Electrical and Electronic Insulation Materials Satoshi Matsumoto (1), Hiroaki Miyake (2), Yoitsu Sekiguchi (3) and Masamichi Kato (4) (1) Shibaura Institute of Technology, Japan (2) Tokyo City University, Japan (3) Sumitomo Electric Industries, Ltd., Japan (4) Yuka Industries, Japan DR-6 Digest Report of Investigating R&D Committee on Standardization of Calibration and N/A Advanced Measurements for Space Charge Distribution at High Temperature using Pulsed Electro-acoustic Method

Yasuhiro Tanaka (1), Hiroaki Uehara (2), Yoshinobu Murakami (3) and Hiroki Mori (4)

(1) Tokyo City University, Japan

(2) Kanto Gakuin University, Japan

(3) Toyohashi University of Technology, Japan

(4) Furukawa Electric Co., Ltd., Japan

DR-7 Digest Report of Investigating R&D Committee on Advanced Nanomaterials and Nanostructure N/A Control for Innovative Organic Devices and Life Science *Keizo Kato (1), Shin-ichro Nakajima (2), Yusuke Aoki (3) and Akira Baba (1)* (1) Niigata University, Japan

(2) Japan Aviation Electronics Industry, Ltd., Japan

(3) Mie University, Japan

- DR-8
 Digest Report of Cooperative Research Committee on EINA Magazine Publication
 N/A

 Masayuki Nagao (1), Yoshiyuki Inoue (2), Masahiro Kozako (3) and Norikazu Fuse (4)
 (1) Toyohashi University of Technology, Japan
 - (2) Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan
 - (3) Kyushu Institute of Technology, Japan
 - (4) Central Research Institute for Electric Power Industry, Japan