

# IEEE TRANSACTIONS on DIELECTRICS and Electrical Insulation

April 2019

Volume 26

Number 2

ITDEIS

(ISSN 1070-9878)

## POWER MODULATOR AND REPETITIVE PULSED POWER

### EDITORIAL

|                                                                                                                                                        |                                                                                                                   |         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------|
| Power Modulators and Repetitive Pulsed Power .....                                                                                                     | <i>W. White, R. Ness, T. Shao, R. Reid and C. Zhang</i>                                                           | 323     |
| A Marx-Based Generator with Adjustable FWHM Using a Controllable Magnetic Switch .....                                                                 | <i>J. N. Nasab, A. Hadizade, S. Mohsenzade, M. Zarghany and S. Kaboli</i>                                         | 324–331 |
| Study on Trigger Mechanism of a Laser Triggered Vacuum Switch .....                                                                                    | <i>Z. He, H. Chen, Y. Xin, Y. Liu, Y. Zhang and Z. Zhang</i>                                                      | 332–338 |
| The Possibility of Using Glycerin as the Dielectric in Pulse Forming Lines .....                                                                       | <i>X. Yang, J.-H. Yang, X.-B. Cheng, J.-Y. Geng and B.-L. Qian</i>                                                | 339–345 |
| Effect of Rise Time on Nanosecond Pulsed Surface Dielectric Barrier Discharge Actuator .....                                                           | <i>Q. Xie, W. Gan, C. Zhang, X. Che, P. Yan and T. Shao</i>                                                       | 346–352 |
| Pattern of Bubble Evolution in Liquids under Repetitive Pulsed Power .....                                                                             | <i>R. Zhang, X. Li and Z. Wang</i>                                                                                | 353–360 |
| A Novel Drive Circuit with Overcurrent Protection for Solid State Pulse Generators .....                                                               | <i>Z. Li, H. Liu, S. Jiang and J. Rao</i>                                                                         | 361–366 |
| Compact Electromagnetic Pulse Forming System Based on the Trigger Vacuum Switch .....                                                                  | <i>Y. Zhou, C. Yao, C. Li, J. Tan, X. Wang, Z. Liao and C. Wang</i>                                               | 367–373 |
| Nanosecond Pulse Generator Based on Cascaded Avalanche Transistors and Marx Circuits .....                                                             | <i>J. Rao, W. Zhang, S. Jiang and Z. Li</i>                                                                       | 374–380 |
| Design of a 5.4 kJ/s Three-Phase Resonant Converter based on a Lithium Polymer Battery .....                                                           | <i>C.-G. Cho, Z. Jia, J.-B. Ahn and H.-J. Ryoo</i>                                                                | 381–389 |
| Compact Microsecond Pulsed Power Generator Driven by Solar Energy for Dielectric Barrier Discharge Applications .....                                  | <i>Z. Fang, Y. Shi, F. Liu and R. Zhou</i>                                                                        | 390–396 |
| Comparative Study of Pulse Trigger and DC Trigger Circuit for Xenon Flash Lamp Drivers .....                                                           | <i>S.-H. Song, C.-G. Cho, S.-M. Park, H.-I. Park and H.-J. Ryoo</i>                                               | 397–404 |
| A High Voltage Multi Level Arbitrary Waveform Generator for Insulation Testing .....                                                                   | <i>P. Lei, Y. Mingtian, L. Geqi, Z. Qiaogen and H. Kun</i>                                                        | 405–411 |
| Spatially Dispersive Nonlinear Transmission Line Experimental Performance Analysis .....                                                               | <i>J. A. Schrock, B. W. Hoff, D. H. Simon, S. L. Heidger, P. Lepell, J. Gilbrech, H. Wood and R. Richter-Sand</i> | 412–415 |
| Plasma Treatment to Improve the Hydrophobicity of Contaminated Silicone Rubber – the Role of LMW Siloxanes .....                                       | <i>S. Li, R. Zhang, S. Wang and Y. Fu</i>                                                                         | 416–422 |
| Design of an Archimedes Spiral Antenna for PD Tests under Repetitive Impulsive Voltages with Fast Rise Times .....                                     | <i>W. Zhou, P. Wang, Z. Zhao, Q. Wu and A. Cavallini</i>                                                          | 423–430 |
| Self-Heating Effect on Stability of a Nanosecond Pulsed DBD Interacting with Heptane and Methylanthalene as Heavy Oil Model Compounds .....            | <i>H. Sun, S. Zhang, Y. Gao, C. Zhang and T. Shao</i>                                                             | 431–438 |
| Simulation of Voltage/Current Waveforms and Contact Area of Pulsed Surface Discharge on Water .....                                                    | <i>T. Furusato, Y. Yamamoto, T. Sakamoto, K. Oura, Y. Matsuda and T. Yamashita</i>                                | 439–446 |
| Advanced NanoDielectric Material Development and Scaling for Use in Compact Ultra-High Voltage Capacitor Prototypes .....                              | <i>S. A. Dickerson, R. D. Curry, S. A. Mounter and L. J. Brown</i>                                                | 447–454 |
| Characterization of the Temperature Dependence of the Electrical and Mechanical Properties of a High Breakdown Strength Nanodielectric Composite ..... | <i>L. J. Brown, S. A. Dickerson, R. D. Curry, S. A. Mounter and J. A. McFarland</i>                               | 455–460 |
| Electroporation Modeling of a Single Cell Exposed to High-Frequency Nanosecond Pulse Bursts .....                                                      | <i>Y. Mi, J. Xu, C. Yao, C. Li and H. Liu</i>                                                                     | 461–468 |
| Numerical Studies into the Paramater Space Conductive to “Lock-On” in a GaN Photoconductive Switch for High Power Applications .....                   | <i>A. R. Chowdhury, S. Nikishin, J. Dickens, A. Neuber, R. P. Joshi and R. Ness</i>                               | 469–475 |
| Bipolar High Voltage Pulse Generator Without H-Bridge Based on Cascade of Positive and Negative Marx Generators .....                                  | <i>Y. Liu, R. Fan, X. Zhang, Z. Tu and J. Zhang</i>                                                               | 476–483 |
| Design and Analysis of an LCC Resonant Converter for Xenon Flash Lamp Simmer Circuit .....                                                             | <i>S.-H. Song, C.-G. Cho, S.-M. Park, H.-I. Park, W.-C. Jeong and H.-J. Ryoo</i>                                  | 484–491 |
| Characteristics of N <sub>2</sub> /O <sub>2</sub> Reaction in Spark Gap Switch: the Effect of High-current Pulsed Arc .....                            | <i>H. Dai, L. Li, H. Wu, J. Xiong, T. Shao and C. Zhang</i>                                                       | 492–500 |
| An Investigation into the Suitability of Insulated Core Transformer Technology for an Ultra High Voltage Power Supply .....                            | <i>R. E. P. Frost, P. L. Lewin and M. Spong</i>                                                                   | 501–507 |
| Modeling of Power Supplies for Power Modulators with LTspice .....                                                                                     | <i>M. G. Giesselmann and V. Roy</i>                                                                               | 508–514 |
| An MMC-Based Modular Unipolar/Bipolar High-Voltage Nanosecond Pulse Generator with Adjustable Rise/Fall Time .....                                     | <i>Y. Mi, H. Wan, C. Bian, W. Peng and L. Gui</i>                                                                 | 515–522 |
| Mechanism of Metal Removal from Metal-Coated Plastics Using Pulsed Power .....                                                                         | <i>T. Yamashita, H. Hosano, H. Akiyama and T. Sakugawa</i>                                                        | 523–529 |

### REGULAR PAPERS

|                                                                                                                                                                        |                                                                                        |         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|---------|
| Multilayers Oil and Oil-Impregnated Pressboard Electric Field Simulation based on Space Charge .....                                                                   | <i>B. Huang, Z. Xu, M. Hao and G. Chen</i>                                             | 530–538 |
| Discharge and Breakdown Mechanism Transition in the Conditioning Process between Plane-Plane Copper Electrodes in Vacuum .....                                         | <i>S. Li, Y. Geng, Z. Liu, J. Wang, Y. Yamano, T. Okura, R. Kyosu and M. Nishiyama</i> | 539–546 |
| Diagnosis of Abnormal Temperature Rise Observed on a 275 kV Oil-Filled Cable Surface – A Case Study .....                                                              | <i>H. Yi, C. Zhou, D. M. Hepburn, M. Kearns and G. Peers</i>                           | 547–553 |
| Influence of Metal Transformer Materials on Oil–Paper Insulation after Thermal Aging .....                                                                             | <i>D. Wang, Z. Zhu, L. Zhang, Y. Qian, W. Su, T. Chen, S. Fan and Y. Zhao</i>          | 554–560 |
| Investigation of Magnetoelectric Effect in Bi <sub>0.5</sub> Na <sub>0.5</sub> TiO <sub>3</sub> -CoMn <sub>0.2</sub> Fe <sub>1.8</sub> O <sub>4</sub> Composites ..... | <i>Y. Kumar, K. L. Yadav, J. Shah and R. K. Kotnala</i>                                | 561–567 |
| Dielectric Properties of Nylon 11/CaCu <sub>3</sub> Ti <sub>4</sub> O <sub>12</sub> (CCTO) Nanocomposite Films with High Permittivity .....                            | <i>P. Thomas, A. Ashokbabu, R. S. Ernest Ravindran and R. Vaish</i>                    | 568–575 |

# IEEE TRANSACTIONS on DIELECTRICS and Electrical Insulation

April 2019

Volume 26

Number 2

ITDEIS

(ISSN 1070-9878)

## (CONTINUED)

|                                                                                                                                                                                          |                                                                                           |         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------|
| HVDC Electrical Insulation Performance Based on Charge Activity in Oil-Pressboard Composite Insulation Structures .....                                                                  | <i>R. Nakane, H. Okubo and K. Kato</i>                                                    | 576–583 |
| Use of Sobol Indexes for Efficient Parameter Estimation in a Charge Transport Model .....                                                                                                | <i>I. Alhossen, F. Baudoin, F. Bugarin, S. Segonds and G. Teyssèdre</i>                   | 584–592 |
| Measurement of Optical Spectrum and Mass Spectrum in Vacuum Surface Flashover for Polymeric Materials .....                                                                              | <i>C. Ren, D. Hu, R. Wang, S. Zhang, C. Zhang, F. Kong, P. Yan and T. Shao</i>            | 593–600 |
| Quantification of the Three-Dimensional Nanoparticle Distribution in Polymer Nanocomposites .....                                                                                        | <i>A.-S. Rempe, M. Stuefer, J. Kindersberger, K. Wagenbauer, P. Ketterer and H. Dietz</i> | 601–609 |
| Thermal and Electrical Properties of a Novel 3-Element Mixed Insulation Oil for Power Transformers .....                                                                                 | <i>R. Liao, D. Feng, J. Hao, L. Yang, J. Li, Q. Wang and S. Zhang</i>                     | 610–617 |
| Characteristics of Micro-Particle Phenomena under Electron Beam Bombardment in Vacuum Pre-Breakdown Processes .....                                                                      | <i>Y. Zhang, S. Chen, X. Xu and L. Jin</i>                                                | 618–624 |
| AC Dielectric Strength of Synthetic Ester-Based $\text{Fe}_3\text{O}_4$ , $\text{Al}_2\text{O}_3$ and $\text{SiO}_2$ Nanofluids – Conformity with Normal and Weibull Distributions ..... | <i>U. Khaled and A. Beroual</i>                                                           | 625–633 |
| Aging Mechanisms of Polymeric Materials under DC Electrical Stress: A New Approach and Similarities to Mechanical Aging .....                                                            | <i>G. C. Montanari, P. Seri and L. A. Dissado</i>                                         | 634–641 |
| Effect of Chemical Impurities on Charge Injection Barriers at the Interface of Copper and Polyethylene .....                                                                             | <i>M. El-Shahat, A. Huzayyin and H. Anis</i>                                              | 642–647 |
| Study of Treeing in Epoxy-Alumina Nanocomposites Using Electroluminescence .....                                                                                                         | <i>J. C. Pandey and N. Gupta</i>                                                          | 648–654 |
| Effect of Material Elasticity on the Longitudinal AC Breakdown Strength of Solid-Solid Interfaces .....                                                                                  | <i>E. Kantar, E. Ildstad and S. Hvidsten</i>                                              | 655–663 |

## DIELECTRIC LETTERS

|                                                                                  |                                                    |         |
|----------------------------------------------------------------------------------|----------------------------------------------------|---------|
| Surface Functional Graded Spacer for Compact HVDC Gaseous Insulated System ..... | <i>J. Li, H. C. Liang, B. X. Du and Z. H. Wang</i> | 664–667 |
| Rejuvenation of Retired Power Cables by Heat Treatment .....                     | <i>Y. Xie, G. Liu, Y. Zhao, L. Li and Y. Ohki</i>  | 668–670 |

## ERRATUM

|                                                                                         |                                                                                                        |     |
|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-----|
| Pressure Wave Propagation Method for Space Charge Measurement in Coaxial Geometry ..... | <i>Y. Sun, Y. Zhang, S. Hole, Z. Zhu, L. Yang, C. Guo, Z. Cao, E. Yu, X. Zheng, F. Zheng and Z. An</i> | 671 |
|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-----|