

CONTENTS

CHAPTER 1: BASIC PHYSICS OF GASEOUS DIELECTRICS

Cross Sections for Electron-Molecule Collision Processes
S. Trajmar 1
Discussion 11

Electron Attachment to Halocarbons of Interest in Gaseous Dielectrics
D. L. McCorkle, A. A. Christodoulides, and L. G. Christophorou 12
Discussion 23

Swarm Parameters in SF₆ and SF₆/N₂-Mixtures Determined from a Time Resolved Discharge Study
Th. Aschwanden 24
Discussion 33

Calculation of Transport Properties of N₂, SF₆, CCl₂F₂ and c-C₄F₈ and Their Respective Mixtures
J. P. Novak and M. F. Fréchette 34
Discussion 41

High Resolution Electron Attachment Measurements at Ultralow Electron Energies: Results in SF₆, CCl₄, CFCl₃, and 2-C₄F₆
A. Chutjian, S. H. Alajajian, and O. J. Orient 42
Discussion 48

Electron Attachment in SF₆ at Low E/N (<300 Td)
M. C. Siddagangappa, C. S. Lakshminarasimha, and M. S. Naidu 49

Net Ionization Rates in Electronegative Gases
W. W. Byszewski, M. J. Enright, and J. M. Proud 53

Monte Carlo Simulation of Ionization and Attachment of Electrons in SF₆
M. S. Dincer and G.R.G. Raju 59

Neon-Hydrogen Penning Ionisation Formula
A.E.D. Heylen 65

CHAPTER 2: BASIC MECHANISMS: PREBREAKDOWN

UV Radiation from Electron Avalanches in SF₆ with Small Admixtures of Nitrogen
T. H. Teich and R. Bräunlich 71
Discussion 81

Streamer Development in Compressed Nitrogen and SF₆
B. Aulbach, B. Lieberoth-Leden, and W. Pfeiffer 82
Discussion 90

Breakdown Characteristics of Inhomogeneous Gaps in High Pressure SF₆
F. Pinnekamp and N. Wiegart 91
Discussion 98

Effect of Field Non-Uniformity on Time-to-Corona Inception in SF ₆ with Insulator	
<i>V. N. Maller and K. D. Srivastava</i>	99
Discussion	104
Investigation of the Positive Point to Plane Corona Discharge in Air	
<i>A. A. Ibrahim and H. Singer</i>	106
Discussion	114
CHAPTER 3: BASIC MECHANISMS: BREAKDOWN	
Pressure-Dependent Electron Attachment and Breakdown Strengths of Unitary Gases, and Synergism of Binary Gas Mixtures: A Relationship	
<i>S. R. Hunter and L. G. Christophorou</i>	115
Discussion	127
Corona Inception, Breakdown and Charge-Injection Measurements in Sphere-Plane Gaps Subjected to Impulse Voltages	
<i>A. J. Davies, J. Dutton, J. Jarvis, A. R. Martinez, and R. T. Waters</i>	128
Discussion	136
The Influence of Atmospheric Negative Ions on the Statistical Time Lag to Spark Breakdown	
<i>I. C. Somerville, O. Farish, and D. J. Tedford</i>	137
Discussion	145
Kinetic Investigation of Avalanche and Streamer Development	
<i>E. E. Kunhardt and Y. Tzeng</i>	146
Discussion	155
Leader Inception in SF ₆	
<i>L. Niemeyer</i>	156
Breakdown of Compressed Air in Concentric Electrode Systems	
<i>B. M. Weedy and A. E. Davies</i>	162
Electric Stress at Breakdown in Uniform Field for Air, Nitrogen, and Sulfur Hexafluoride	
<i>E. Husain and R. S. Nema</i>	168
CHAPTER 4: GAS MIXTURES	
Modification of Corona Stabilization in Electronegative Gases by Low Ionization Potential Additives	
<i>J. K. Nelson</i>	175
Discussion	183
Minimum Critical Field Strength for the Propagation of a Discharge in SF ₆ and Other Gaseous Dielectrics	
<i>G. Biasiutti and W. Zaengl</i>	184
Discussion	194
On the Choice of a Test Gap for Strongly Electronegative Gases and Gas Mixtures	
<i>I. W. McAllister</i>	195
Discussion	203
A Current Assessment of the Potential of Dielectric Gas Mixtures for Industrial Applications	
<i>D. W. Bouldin, D. R. James, M. O. Pace, and L. G. Christophorou</i>	204
Discussion	212

CHAPTER 5: GASEOUS PHENOMENA IN SWITCHING

Basic Topics of Current Interest to Switching for Pulsed Power Applications	
<i>E. E. Kunhardt</i>	213
Discussion	223
Transport Properties and Dielectric Strengths of Gas Mixtures for Use in Diffuse Discharge Opening Switches	
<i>S. R. Hunter, J. G. Carter, L. G. Christophorou, and V. K. Lakdawala</i>	224
Study of Gas Mixtures for E-Beam Controlled Switches	
<i>V. E. Scherrer, R. J. Commisso, R. F. Fernsler, and I. M. Vitkovitsky</i>	238
Investigations of E-Beam Controlled Diffuse Discharges	
<i>K. Schoenbach, G. Schaefer, M. Kristiansen, H. Krompholz, H. Harjes, and D. Skaggs</i>	246
Discussion	254
Transient Gas Discharges in Perfluorocarbon Argon Mixtures	
<i>W. W. Byszewski, M. J. Enright, and J. M. Proud</i>	255

CHAPTER 6: GAS DECOMPOSITION, REACTIONS, AND BIOENVIRONMENTAL EFFECTS

Decomposition of Sparked SF ₆ and Cytotoxicity of SF ₆ Decomposition Products	
<i>G. D. Griffin, I. Sauers, C. E. Easterly, H. W. Ellis, and L. G. Christophorou</i>	261
Discussion	273
Production Rates for Discharge Generated SOF ₂ , SO ₂ F ₂ , and SO ₂ in SF ₆ and SF ₆ /H ₂ O Mixtures	
<i>R. J. Van Brunt, T. C. Lazo, and W. E. Anderson</i>	276
Discussion	284
On Reactions Occurring in the Gaseous Phase in Decomposed SF ₆	
<i>H. Latour-Słowikowska, J. Lampe, and J. Słowikowski</i>	286
Negative Ion Formation in SF ₆ Spark By-Products	
<i>I. Sauers, L. G. Christophorou, and S. M. Spyrou</i>	292
Discussion	305
Corona Induced Surface Modifications in Fluorinated Atmospheres	
<i>A. Goldman, M. Goldman, J. Amouroux, and F. Arefi</i>	306
Oxide Layer Damage of Anodized Aluminium Electrodes from Electric Breakdowns in Pressurized SF ₆	
<i>A. E. Vlastós</i>	311
Postbreakdown State of Aluminium Electrodes in SF ₆	
<i>A. E. Vlastós</i>	317

CHAPTER 7: TIME-VOLTAGE CHARACTERISTICS

Time Characteristics and Breakdown Development for Steep Fronted Pulses	
<i>W. Pfeiffer</i>	323
Discussion	333
Influence of an Insulating Spacer on the V-T Characteristics of Coaxial Conductors with Compressed-SF ₆ Insulation	
<i>N. G. Trinh, G. R. Mitchel, and C. Vincent</i>	335
Discussion	342

The Effect of Impulse Waveshape on Point/Plane Breakdown in SF ₆ <i>I. D. Chalmers, O. Farish, and S. J. MacGregor</i>	344
Discussion	352
A Preliminary Assessment of the Impact of the Electromagnetic Pulse on Electric Power System Insulation <i>B. W. McConnell and P. R. Barnes</i>	354
The Influence of a Crossed Magnetic Field on the Formative Time Lags Below Paschen Minimum <i>G.R.G. Raju</i>	364
Negative Corona Inception as Influenced by Steepness of the Applied Impulse Waves <i>M. Abdel-Salam and S. Abdel-Sattar</i>	370
CHAPTER 8: EFFECTS OF PARTICLES AND SURFACE FLASHOVER	
Particle Contamination in Gas-Insulated Systems: New Control Methods and Optimum SF ₆ /N ₂ Mixtures <i>M. O. Pace, J. L. Adcock, and L. G. Christophorou</i>	377
Discussion	385
Corona Stabilized Breakdown in Particle Contaminated Compressed SF ₆ Systems <i>H. Anis, M. M. Morcos, and K. D. Srivastava</i>	387
Discussion	395
Surface Flashover Characteristics of Epoxy Spacers in Compressed Gases <i>C. N. Reddy, R. Lakshmipathi, and K. U. Abraham</i>	396
Surface Charge Measurement in Air and SF ₆ <i>P. Connolly and O. Farish</i>	405
Discussion	413
On the Electrostatic Field Near the Charged Surface of an Insulator with Special Reference to Surface Charge Probe Measurements <i>A. Pedersen</i>	414
Discussion	421
Electrical Breakdown of Solid Insulators in Air and in Vacuum <i>A. S. Pillai and R. Hackam</i>	422
Influence of Solid Dielectrics Upon Breakdown Voltage and PredischARGE Development in Compressed Gases <i>M. Giesselmann and W. Pfeiffer</i>	431
Influence of Solid Insulation on the Dielectric Performance of SF ₆ Configurations <i>A. Bargigia, R. Brambilla, A. Pigini, and G. Rizzi</i>	437
CHAPTER 9: GAS-INSULATED EQUIPMENT	
Measurement of Charge Accumulation on Conical Spacer for 500 kV DC GIS <i>H. Ootera, K. Nakanishi, Y. Shibuya, Y. Arahata, and T. Nitta</i>	443
Discussion	451
Partial Discharge and Breakdown Studies in Voids, Gas Wedges, and Around Lead Structures in Model Gas Transformer Windings <i>R. J. Schwabe, C. W. Reed, and W. N. Kennedy</i>	452
Discussion	461

Generation and Effects of Low Level Contamination in SF ₆ -Insulated Equipment <i>F. Y. Chu, H. A. Stuckless, and J. M. Braun</i>	462
Discussion	472
Calculation of Disconnecter Induced Overvoltages in Gas-Insulated Substations <i>N. Fujimoto, H. A. Stuckless, and S. A. Boggs</i>	473
Discussion	481
A System Approach to Particle Control for HVDC GITL <i>M. Ouyang</i>	482
Discussion	491
Analysis of AC Corona Power Loss for Single Phase Transmission Lines <i>M. Abdel-Salam, M. Farghally, S. Abdel-Sattar, and D. Shamloul</i>	492
The Breakdown Characteristics of Long Air Gaps in 220 kV Indoor Substations <i>Y. C. Chen</i>	498
CHAPTER 10: TESTING AND RELIABILITY	
Detecting and Locating Partial Discharges in Metalclad Equipment <i>B. F. Hampton and A. G. Newlands</i>	505
Discussion	513
Selection of the Time Parameters of Oscillating Impulse Voltages for On-Site Testing of GIS <i>W. Hauschild, W. Schrader, W. Mosch, and K. Petzold</i>	515
Discussion	523
Influence of Temperature on the Transient Breakdown in SF ₆ Gas-Impregnated Polymer Film Structures <i>C. W. Reed and R. J. Schwabe</i>	524
Discussion	530
Influence of Experimental Conditions on Dielectric Properties of SF ₆ -Insulated Systems—Theoretical Considerations <i>S. A. Boggs and N. Wiegart</i>	531
Discussion	540
The Application of ADP System in R.F. Discharge Diagnostics <i>G. X. Chen and H. C. Hsu</i>	542
CHAPTER 11: REPORTS OF DISCUSSION GROUPS	
Group Discussion on Data Needed from Basic Physics for Modeling <i>E. Marode (Chairman), S. R. Hunter (Co-Chairman), Th. Aschwanden, O. Farish, I. Gallimberti, L. E. Kline, L. C. Pitchford, R. S. Sigmond, and R. J. Van Brunt</i>	549
Group Discussion on Requirements of Gas Mixtures for Power Transmission and Distribution Lines <i>A. H. Cookson (Chairman), D. R. James (Co-Chairman), R. Eaton, R. Hackam, K. Nakanishi, J. J. Pachot, A. Pigini, and F. Pinnekamp</i>	561
Group Discussion on Requirements of Gas Mixtures for Transformers and Circuit Breakers <i>T. Nitta (Chairman), D. W. Bouldin (Co-Chairman), T. Kawamura, M. S. Mashikian, F. Pinnekamp, and V. Tahliliani</i>	574

Group Discussion on Decomposition and Toxicity of Electrically Discharged SF ₆ <i>I. Sauers (Chairman), F. Y. Chu (Co-Chairman), W. G. Dreibelbis,</i> <i>G. D. Griffin, R. H. Knight, and R. J. Van Brunt</i>	580
LIST OF PARTICIPANTS	595
PHOTOGRAPHS OF PARTICIPANTS	603
AUTHOR INDEX	609