

CONTENTS

CHAPTER 1: BASIC PHYSICS OF GASEOUS DIELECTRICS

Ionic and Electronic Processes in Sulfur hexafluoride <i>W. F. Schmidt, H. Jungblut, D. Hansen, and H. Tagashira</i>	1
Discussion	11
Calculation of Electric Field-Induced Detachment Rate of Electrons from Mononegative Ions; Relevance to Gaseous Dielectrics <i>H. C. Schweinler and L. G. Christophorou</i>	12
Discussion	24
Electron Swarm Data Relevant to High-Voltage Insulation <i>E. Beaty, J. Dutton, and L. Pitchford</i>	25
Discussion	31
A Critique of Methods for Calculating the Dielectric Strength of Gas Mixtures and a Proposed Test for $\bar{\eta}$ -Synergism <i>R. E. Wootton and P. J. Chantry</i>	32
Discussion	42

CHAPTER 2: BASIC MECHANISMS: CORONA AND BREAKDOWN IN AIR

Zone of Influence of the Streamer at the Cathode of a Positive Point to Plane Corona Discharge in Air <i>A. Goldman and M. Hirsh</i>	43
Discussion	53
Relative Importance of Active Synchronous Component in the Current of a Corona Discharge <i>E. Crochet, M. Goldman, and R. Haug</i>	54
Discussion	64
Possible Interpretation of the Gas Discharge Structure in a Rod/Plane Gap <i>P. Savic and M. M. Kekez</i>	65
Discussion	73
Breakdown and V-I Characteristics of Dry Air Below Paschen Minimum in Crossed Electric and Magnetic Fields <i>G. R. Govinda Raju and A. D. Mokashi</i>	76

CHAPTER 3: BASIC MECHANISMS: DISCHARGE PROCESSES IN SF₆

Impulse Breakdown and Prebreakdown Corona Processes in SF ₆ and SF ₆ /N ₂ Mixtures <i>O. E. Ibrahim and O. Farish</i>	83
Discussion	91
The Relation Between Luminous Phenomena and Discharge Mechanism in SF ₆ <i>W. Pfeiffer and A. Leitl</i>	92
Discussion	99
Electrical Breakdown in Compressed SF ₆ Between Highly Polished Electrodes <i>I. C. Somerville and D. J. Tedford</i>	100
Discussion	107
Effect of Polarity on the Breakdown Voltage of Gas Gaps <i>M. Abdel-Salam and W. Abul-Shohoud</i>	108
Discussion	114

CHAPTER 4: NEW GASEOUS DIELECTRICS

New Unitary and Multicomponent Gaseous Dielectrics <i>D. R. James, L. G. Christophorou, and R. A. Mathis</i>	115
Discussion	126

The Breakdown Behavior of Some New Gases and Gas Mixtures in Uniform and Nonuniform Fields	
<i>E. Gockenbach</i>	128
Discussion	136
Electric Strength of Some Gases and Gas Mixtures	
<i>R. E. Wootton, S. J. Dale, and N. J. Zimmerman</i>	137
Discussion	147
DC Breakdown Strengths of Some Multicomponent Gas Mixtures in Concentric Cylinder Geometries	
<i>C. C. Chan, M.O. Pace, and L. G. Christophorou</i>	149
Discussion	159
Paschen Characteristics of Gases in Crossed Magnetic Field	
<i>A. E. D. Heylen</i>	160

CHAPTER 5: IMPULSE BREAKDOWN

Electrical Breakdown Studies of SF ₆ /CO ₂ /Fluorocarbon Mixtures	
<i>A. H. Cookson and M. J. Mastroianni</i>	169
Discussion	178
Impulse Breakdown of Corrugated Coaxial Electrodes in Compressed SF ₆	
<i>S. J. Dale and A. H. Cookson</i>	179
Discussion	188
Impulse Breakdown of c-C ₄ F ₈ /SF ₆ and c-C ₄ F ₈ /SF ₆ /N ₂	
<i>R. Y. Pai and L. G. Christophorou</i>	190
Discussion	198

CHAPTER 6: SURFACE EFFECTS

Evaluation of the Effect of Surface Defects on Breakdown in Strongly Electronegative Gases or Gas Mixtures	
<i>A. Pedersen</i>	201
Discussion	209
Influence of Coating Polished and Rough Electrodes on the Impulse and AC Breakdown of SF ₆	
<i>A. E. Vlastos and S. Rusck</i>	210
Electrode-Area and Surface-Roughness Effects on Breakdown of SF ₆ /N ₂ Mixtures	
<i>C. Korasli, I. C. Somerville and O. Farish</i>	218
Discussion	226
Flashover Studies in SF ₆ -N ₂ Mixtures Using Direct Applied Voltages	
<i>J. R. Laghari, A. H. Qureshi, and G. D. Theophilus</i>	227
Discussion	235
The Effect of Surface Roughness on the AC Corona Onset Voltage for Cylindrical Conductors in Air	
<i>R. Morrow and V. T. Morgan</i>	237

CHAPTER 7: EFFECTS OF PARTICLES

Influence of Conductive Particles on the DC-Voltage Strength of Spacers in Compressed SF ₆	
<i>W. Pfeiffer and P. Völker</i>	243
Discussion	249
Influence of Conducting Particle Attached to an Epoxy Resin Spacer on the Breakdown Voltage of Compressed-Gas Insulation	
<i>M. Eteiba, F. A. M. Rizk, N.-G. Trinh, and C. Vincent</i>	250
Discussion	255

Effects of Particle Contamination in SF ₆ CGIT Systems and Methods of Particle Control and Elimination	
<i>S. J. Dale, R. E. Wootton, and A. H. Cookson</i>	256
Discussion	265

Particle Traps in Gas-Insulated Systems	
<i>R. W. Afzelius and H. W. Bergqvist</i>	266
Discussion	274

Electrostatics of Particle Control in Gas-Insulated Apparatus	
<i>C. M. Cooke</i>	275

CHAPTER 8: DECOMPOSITION, AGING, AND SIMULATION

Thermal Aging of Dielectric Gases	
<i>T. W. Dakin</i>	283
Discussion	293
Prediction of Electrical Breakdown Carbonization of Gases and Gas Mixtures	
<i>R. W. Wootton, R. W. Lieberman, M. R. Kegelman, and J. B. Thompson</i>	294
Discussion	302
Partial-Discharge Pulse Height Distributions and Frequencies for Positive and Negative DC Corona in SF ₆ and SF ₆ -N ₂ Mixtures	
<i>R. J. Van Brunt, J. S. Hiltun, and D. P. Silver</i>	303
Discussion	310
The Application of Charge Simulation Method to Three Dimensional Asymmetric Field with Two Dielectric Media	
<i>T. Sakakibara, S. Sato, N. Kobayashi, and S. Menju</i>	312
Discussion	321

CHAPTER 9: STANDARDS AND TESTING

Test Electrodes for Measuring the Intrinsic Insulating Strength of Gases	
<i>C. M. Cooke</i>	323
Discussion	331
High Voltage Testing of Metal-Enclosed Gas-Insulated Substations On-Site with Oscillating Switching Impulse Voltages	
<i>K. Feser</i>	332
Implications in Long-Term Field Testing of Gas-Insulated Equipment	
<i>H. Kuwahara, T. Tanabe, S. Matsuda, and T. Nitta</i>	341
Discussion	348
Transient High Voltages on the Grounded Enclosures of Gas-Insulated Transmission Equipment	
<i>G. L. Ford and S. A. Boggs</i>	349
Discussion	357
Partial Discharge Location in Gas-Insulated Switchgear	
<i>S. A. Boggs, G. L. Ford, and F. Y. Chu</i>	358
Discussion	366
The Measurement of DC Voltages up to 1 MV Using Sphere-Gaps and Rod-Gaps	
<i>T. E. Allibone and J. C. Saunderson</i>	367
Switching Surge Discharge Characteristics of Large Conductor-Tower Air Gaps	
<i>I. L. Krömer</i>	375
A Solution of Laplace's Equation for Hyperboloidal Electrodes with Applications to Dielectric Testing in Nonuniform Electric Fields	
<i>T. L. Ferrell, J. K. Baird, D. R. James, M. O. Pace, and L. G. Christophorou</i>	383

CHAPTER 10: GAS-INSULATED EQUIPMENT

The Future Testing Needs of Gas-Insulated Substations <i>T. F. Garrity and J. P. Vora</i>	389
Discussion	399
Experimental Study of the Breakdown Characteristics of Large Scale Gas-Insulated Systems <i>K. Nakanishi, Y. Shibuya, and T. Nitta</i>	400
Discussion	408
Partial Discharge Inception and Breakdown Studies on Model Sheet-Wound, Compressed SF ₆ Gas-Impregnated Polymer Film-Insulated Windings <i>C. W. Reed, S. F. Philip, M. Kawai, and H. M. Schneider</i>	409
Discussion	417
Dynamics of Power Arcs in Co-Axial Electrode Geometry <i>F. Y. Chu, C. K. Law, and S. A. Boggs</i>	418
Discussion	427

CHAPTER 11: BIOENVIRONMENTAL EFFECTS

Aspects of Environmental Effects of Dielectric Gases <i>I. Sauers, L. G. Christophorou, L. C. Frees, and H. W. Ellis</i>	429
Discussion	438
Assessment of Potential Health Effects of Dielectric Gases <i>G. D. Griffin, C. E. Easterly, and P. J. Walsh</i>	439
Discussion	449
The Toxicology of Certain Gaseous Fluorocarbons <i>H. J. Trochimowicz</i>	450
Discussion	459
Testing and Evaluation of Chemical Hazards Under the Toxic Substances Control Act <i>J. J. Merenda</i>	460
Discussion	466

CHAPTER 12: FORUMS

Forum I: Future Research Directions in Gaseous Dielectrics <i>W. Pfeiffer, F. Bastien, J. Dutton, M. J. Mastroianni, I. Sauers, A. H. Sharbaugh, and W. Zaengl</i>	467
Forum II: Future Directions in Gas-Insulated Apparatus <i>T. F. Garrity, A. H. Cookson, G. Meinders, E. Spencer, T. Kawamura, and J. K. Wittle</i>	475
List of Participants	485
Photographs of Participants	492
Author Index	495