CONTENTS

D	ELJ	ECTRIC BREAKDOWN IN SOLID INSULATION J. H. MASON	1
	1.	Introduction	
	2.	Intrinsic Strength Investigations Effect of Temperature on the Strength of Polymers—Electromechanical Breakdown—The Effect of Ionic Conductivity in Glass—Mechanical Stress Effects in Alkali-halide Crystals—Time Effects and Breakdown in Alkali-halide Crystals—Directional Breakdown in Alkali-halide Crystals	9
	3.	Breakdown in Divergent Fields Evidence of Stress-enhanced Conductivity—Effects of Space Charge	
	4.	Breakdown by Internal Discharges Factors Affecting the Inception Voltage and the Magnitude of Discharges in Gaseous Inclusions—Discharges with Direct Voltage and Surges—Discharges with Alternating Voltage—Discharges in Oil-impregnated Paper Insulation—Rate of Deterioration by Internal Discharges—Mechanisms of Deterioration by Internal Discharges	
	5.	Breakdown by Surface Discharges Factors Affecting the Discharge Inception Voltage and the Behaviour of Discharges—Mechanisms of Deterioration and Breakdown by Surface Dis- charges—Resistance to Erosion by Surface Discharges—Resistance to Chemical Attack—Resistance to Tracking—Breakdown in Short Times— Variation of Electric Strength with Time of Voltage Application—Factors Affecting Short-time Electric Strength Tests	
	6.	Electrochemical Deterioration	
	7.	Electrical Tests for Insulation Conventional Tests—Direct Voltage and Impulse Tests—Discharge Detection Tests—Dispersion Test for Ionic Contamination—Absorption Test for Micaceous Insulation	
	8.	Prospects	
D	REC	CTIONAL BREAKDOWN EFFECTS IN CRYSTALS J. W. DAVISSON	59
	1.	Classification of Directional Effects	
	2.	Experimental Techniques Partial-breakdown Paths—Metallic Dendrites	
	3.	Experimental Background	
	4.	Theoretical Background	
	5.	Breakdown Paths in the Alkali Halides	
	6.	Star Patterns	
	7.	Mechanical Properties	
	8.	The Magnitude Effect	

9. Sulphur

10. Surface Breakdown Paths11. Metallic Dendrites

12.	Breakdown Paths in Non-centrosymmetrical Crystals
	Breakdown Through an Inversion Twin Boundary-Study of Twinning-
	Determination of Crystal Symmetry—Breakdown in ADP and KDP
	Crystals-Breakdown Configurations in Sodium Chlorate and Sodium
	Bromate Crystals—Breakdown in Ferroelectric Crystals

- 13. Rupture Breakdown
- 14. Pre-breakdown Orientation Effects
- 15. Theories of Path Formation

THE ELECTRIC STRENGTH AND HIGH-FIELD CONDUCTIVITY OF DIELECTRIC LIQUIDS T. J. LEWIS

97

- 1. Introduction
- Experimental Techniques
 Liquid Treatments—Test Cells—Electrodes—Voltage Sources and Conductivity Measurements
- Conduction in Dielectric Liquids
 Natural and Induced Conductivity—Ionic Mobilities—High-field Conductivity—Current Fluctuations
- 4. Breakdown
 General Breakdown Criterion—Electrode Effects—Liquid Effects—Spacecharge Theories of Breakdown
- 5. Breakdown Time-lag
- 6. Miscellaneous Investigations

GASEOUS DIELECTRICS

T. W. LIAO AND R. E. PLUMP 141

- Introduction
 The Desirable Properties of Gases for Practical Use—Mixtures
- Theoretical and Experimental Advances
 Early Developments—Some Recent Progress—Forces and Energies
- 3. Practical Developments
 Rotating Machinery—Transformers—Cables, Waveguides, and Currentinterrupting Devices—The Patent Literature
- Chemical Properties and Effects
 Thermal and Chemical Stability—Flammability—Toxicity—Ease of Production, Purification, and Re-use
- 5. Physical Properties and Effects Condensability—Heat Transfer

FERROELECTRICITY OF BARIUM TITANATE SINGLE CRYSTALS

A. D. Franklin 171

- 1. Introduction
- 2. Crystal Chemistry of Barium Titanate
- 3. Preparation of Specimens
- 4. Classification of Ferroelectric Properties General Considerations—Domains
- 5. Static Properties

 Cubic-Tetragonal Transition—The Tetragonal-Orthorhombic Transition
- 6. Dynamic Properties
- 7. Summary

271

- 1. Introduction
- 2. The Perfect Crystal

 The Energy-band Model—Chemical Bonds
- Imperfect Crystals
 Stoichiometric Crystals—Non-stoichiometric Crystals—Foreign Atoms—The Effect of Imperfections on the Dielectric Properties
- 4. Elements: Structure and Properties

 Boron—Elements of Group IVB—Elements of Groups VB, VIB, and VIIB
- Binary Compounds: Structure and Properties
 Halides—Sulphides, Selenides, and Tellurides—Nitrides—Phosphides—
 Carbides
- 6. Trends in Properties of Binary Compounds
- 7. Boron Nitride

 Preparation of Boron Nitride—Properties of Boron Nitride—Applications
 of Boron Nitride
- Silicon Nitride
 Preparation of Silicon Nitride—Properties of Silicon Nitride—Applications of Silicon Nitride
- 9. Aluminium Nitride
 Preparation of Aluminium Nitride—Properties of Aluminium Nitride
- 10. Conclusion

A*

ELECTROPHORETIC DEPOSITION OF INSULATING MATERIALS J. B. BIRKS

- 1. Introduction

 Electrophoresis—Electrokinetic Effects—Historical
- The Boundary Potential and the Electrical Double Layer
 The Contact Potential—The Adsorption Potential—The Lyoelectric
 Potential—Theory of the Double Layer
- 3. Theory of Electrophoretic Deposition

 Electrophoretic Migration—Electrophoretic Deposition—Dielectrophoresis
- 4. Technical Applications
 Silicic Acid and Silica—Alkaline-earth Carbonates—Alumina—Other
 Refractory Materials—Organic Resins and Lacquers—Deposition of Airborne Particles