

Contents

Preface	iii
Contributors	xi
1. Properties of Ceramic Insulators	1
<i>Relva C. Buchanan</i>	
I. Introduction	1
II. Compositions	3
III. Thermal and Mechanical Properties	22
IV. Dielectric Strength	26
V. Dielectric Properties	31
VI. Insulation Resistance	43
References	64
2. Ceramic Capacitor Materials	69
<i>Gilbert Goodman [Revisions: Relva C. Buchanan and Thomas G. Reynolds III]</i>	
I. Introduction	69
II. Historical Background	70
III. Ferroelectricity in Capacitor Technology	71
IV. Dielectric Properties of Multiphase Systems	72
V. Basic Ceramic Dielectric Materials	75
VI. Performance Categories of Ceramic Capacitors	80
VII. Varieties of Ceramic Capacitors	80
VIII. Capacitor Performance Parameters	108
IX. Packaging of Ceramic Capacitors	117
Appendix: Typical Ceramic Dielectric Compositions	121
References	123

3. Piezoelectric and Electrooptic Ceramics	129
<i>Gene H. Haertling</i>	
I. Introduction	129
II. Piezoelectric Ceramics	131
III. Ferroelectric Ceramics	138
IV. Electrooptic Ceramics	141
V. Materials	150
VI. Properties	159
VII. Applications	182
References	202
4. Ferrite (Magnetic) Ceramics	
<i>Thomas G. Reynolds III and Relva C. Buchanan</i>	
I. Introduction	207
II. Spinel Ferrites	211
III. Hexagonal Ferrites	221
IV. Garnet	222
V. Processing	225
VI. Single-Crystal Ferrite	236
References	245
5. Ceramic Sensors: Theory and Practice	
<i>David C. Hill and Harry L. Tuller</i>	
I. Introduction	249
II. Theory	250
III. Transducer Classifications	269
IV. Transition from Theory to Practice	270
V. Future Prospects	338
Appendix: Thermophysical Properties	339
References	344
6. Application and Characterization of ZnO Varistors	349
<i>Lionel M. Levinson and Herbert R. Philipp</i>	
I. Introduction	349
II. Varistor Electrical Characteristics	350
III. Varistor Microstructure and Fabrication	355
IV. Varistor Equivalent Circuit	360
V. Mechanism of Varistor Behavior	363
VI. Varistor Applications	372
VII. Conclusions	374
References	375

7. Highly Conductive Ceramics	379
<i>Harry L. Tuller</i>	
I. Introduction	379
II. Electronic Conduction in Oxides	381
III. Defect-Controlled Transport	398
IV. Ionic Conduction in Oxides	413
V. Fast Ion Conduction	415
VI. Applications	428
VII. Conclusions	429
References	430
8. Materials Aspects of Thick-Film Technology	435
<i>Robert W. Vest</i>	
I. Introduction	435
II. Initial Materials	436
III. Processing	444
IV. Conductors	451
V. Dielectrics	461
VI. Resistors	466
VII. Completing the Hybrid	482
VIII. Summary	484
References	485
9. Multilayer Ceramic Technology	489
<i>Wayne S. Young and Sarah H. Knickerbocker</i>	
I. Introduction	489
II. The Sequential MLC	490
III. The Laminated MLC	490
IV. MLC Development	491
V. MLC Design	492
VI. The Laminated-MLC Process	493
VII. Summary	519
References	521
Index	527