

## **3. Dielectrics**

### **3.1 Definitions and General Relations**

#### **3.1.1 Polarization and Dielectric Constant**

#### **3.1.2 Summary to: Polarization and Dielectric Constant**

### **3.2 Mechanisms of Polarization**

#### **3.2.1 General Remarks**

#### **3.2.2 Electronic Polarization**

#### **3.2.3 Ionic Polarization**

#### **3.2.4 Orientation Polarization**

#### **3.2.5 Summary and Generalization**

#### **3.2.6 Local Field and Clausius - Mosotti Equation**

#### **3.2.7 Summary to: Polarization Mechanisms**

### **3.3 Frequency Dependence of the Dielectric Constant**

#### **3.3.1 General Remarks**

#### **3.3.2 Dipole Relaxation**

#### **3.3.3 Resonance for Ionic and Atomic Polarization**

#### **3.3.4 Complete Frequency Dependence of a Model Material**

#### **3.3.5 Summary to: Frequency Dependence of the Dielectric Constant**

### **3.4. Dynamic Properties**

#### **3.4.1 Dielectric Losses**

#### **3.4.2 Summary to: Dynamic Properties - Dielectric Losses**

### **3.5 Electrical Breakdown and Failure**

#### **3.5.1 Observation of Electrical Breakdown and Failure**

#### **3.5.3 Summary to: Electrical Breakdown and Failure**

### **3.6 Special Dielectrics**

#### **3.6.1 Piezo Electricity and Related Effects**

#### **3.6.2 Ferro Electricity**

#### **3.6.3 Summary to: Special Dielectrics**

### 3.7 Dielectrics and Optics

### 3.8 Summary: Dielectrics