Krefine ESD Control Materials

The surface resistance is easily controlled at the specific levels required for ESD control materials by use of Krefine's special carbon technology. Krefine stock shapes provide consistent, repeatable surface and volume ESD values regardless of the thickness or measurement point on the stock shape.

Grade	EKH-SS07 PEEK	EKH-SS09 PEEK	EKH-SS10 PEEK	EKH-SS11 PEEK
Base Polymer	PEEK			
Surface Resistance	10^{6-8} ohms	10^{7-9} ohms	10^{9-10} ohms	10^{10-11} ohms
Typical Applications	Hard Disk Drive	Wafer Handling	Burn-in & Test Sockets	

Grade	EKR-S120 PEEK	EKR-S130 PEEK	ESH-SS07 PES	ESH-SS11 PES
Base Polymer	PEEK		PES	
Surface Resistance	10^{13} ohms	10^{12} ohms	10^{6-8} ohms	10^{10-11} ohms
Typical Applications	Test Sockets for High Frequency		Hard Disk Drive Wafer Handling	Burn-in & Test Socket

Grade	EIH-SSC PEI	EIH-SS11 PEI	CDH-SS08 PPS	BIH-SS07 PBI
Base Polymer	PEI		PPS	PBI
Surface Resistance	10^{6} ohms	10^{10-11} ohms	10^{7-9} ohms	10^{6-8} ohms
Typical Applications	Hard Disk Drive, Wafer Handling	Burn-in & Test Sockets	Hard Disk Drive, Wafer Handling	

Krefine has been developed with Kureha's unique carbon materials and original compounding technology. Krefine is able to overcome the problems associated with conventional Electrical Conductive Polymer Composites in the ESD sensitive environments and other fields.

Key Features

- Homogenous surface and volume resistivity.
- Ability to control respective resistivities within 10 to the first power in the range of 10E6-10E12 ohms/sq
- Low metal contamination.
- Low out-gassing

Range of ESD Resistance (Surface & Volume)

Krefine SS11 series : 10^{10-12} ohm
Krefine SS09 series : 10^{8-10} ohm
Krefine SS07 series : 10^{6-8} ohm

Application

Wafer Carriers
FOUP
IC Test Socket
Burn-In Socket
Slider Tray
HDD related parts
Liquid crystal display cassettes
Liquid crystal display related parts
Storage trays and bins
Chip Carriers
Spin Chuck
IC & HGA trays

Base Polymer

PEEK (Polyetheretherketone)
PES (Polyethersulfone)
PEI (Polyetherimide)
LCP (Liquid crystalline polymers)
PPE (Polyphenylene ether)
PBT (Polybutylene terephthalate)
PC (Polycarbonate)
POM (Polyacetal)
PVDF (Polyvinylidene fluoride)
Others

Scroll to next page for ESd Overview

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What is ESD?(Electro-Static Discharge)

When a charged material is used for a product that comes into direct contact with an electronic part, rapid discharging occurs by contact with the charged material, and the electronic part can be easily damaged.

An ESD occurrence requires all of the following three factors:
- Charge generation
- Charge accumulation
- Rapid discharge

Without all three events, an ESD event would never occur. Therefore if you want to control ESD, all that is necessary is to eliminate one of the above three (3) factors.

What is a Static Dissipative Material ?

A static dissipative material is defined as a material having a surface resistance (SR) from $1x10^5$ ohm to $1x10^{11}$ohm as defined by the International Electrotechnical Commission (IEC) 61340-5-1

A static dissipative material is difficult to charge and its charge transfer speed is not high making it an ideal material for ESD sensitive applications.

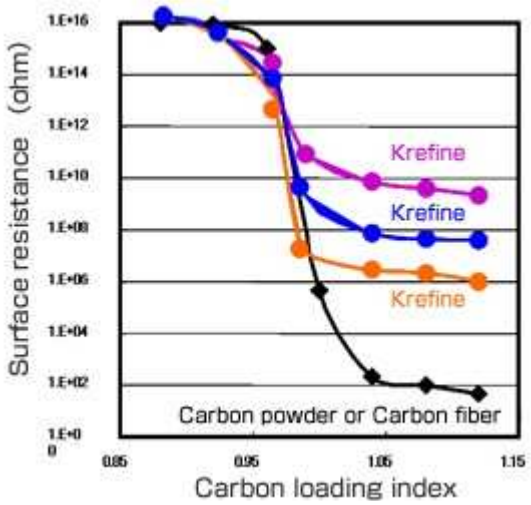
Classification of the surface resistance of ESD materials by the IEC

- Conductive material, $1\times 10^2 \leqq Rs < 1\times 10^5\ \Omega$
- Static dissipative material, $1\times 10^5 \leqq Rs < 1\times 10^{11}\ \Omega$
- Insulative material, $1\times 10^{11} \leqq Rs$

Static dissipative materials are strongly recommended for the protection of electrostatic discharge sensitive devices (ESDS).

Electrical Resistance Control Technology

A products surface resistance can be easily controlled at the specific levels required for ESD control materials through the use of Krefine's special carbon technology.
Krefine can guarantee the surface resistance of its products within the first power of plus or minus 10.



Beyond a certain critical special carbon content, the surface resistance of a compound decreases with an increase in the special carbon content to 10^{10} ohms. The surface resistance of the compound in the critical

content region depends on the resistance of the special carbon. Further increasing the special carbon content beyond the critical content region, results in a very small resistance change versus the higher levels of special carbon. However, when carbon powder or carbon fibers are employed, the surface resistance drops sharply beyond the critical carbon content level to approximately 10^2 ohm

Characteristics of Krefine Product

Problems Associated with Conductive Polymer Composites:

Conductive polymer composites are obtained by loading conductive fillers, such as carbon black, carbon fiber, graphite and metal fiber, in an insulating polymer. They have been used in ESD protected environments and for other ESD sensitive applications for years.

Unfortunately when an increase of conductive fillers is used to obtain a low resistance value, the following problems can arise:

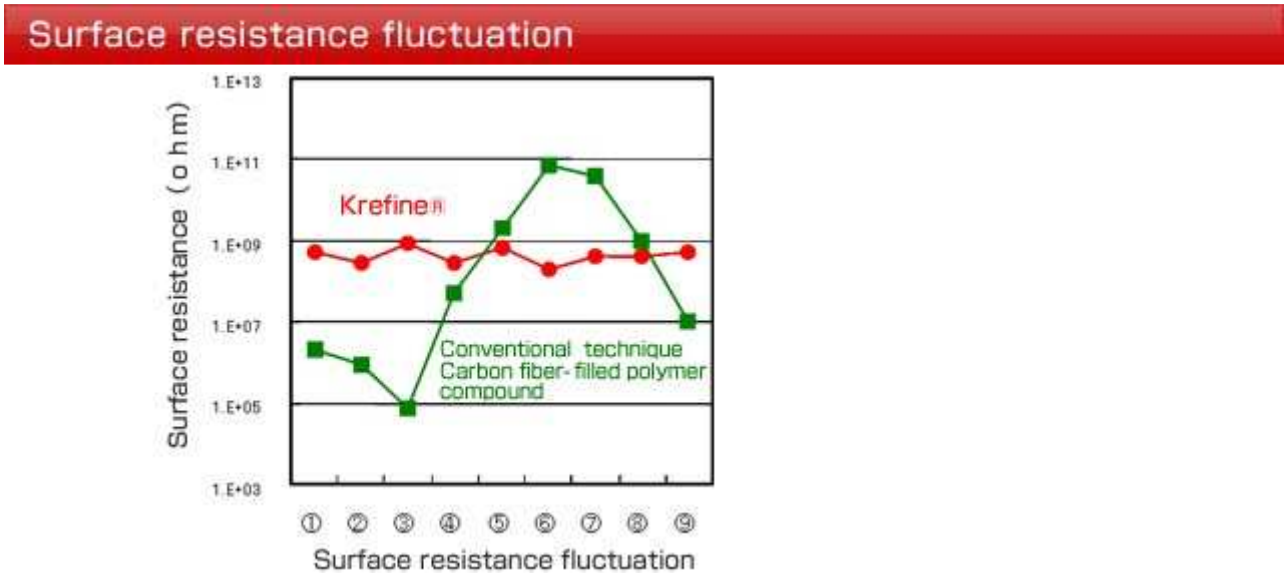
- It is difficult to obtain consistent controllable resistance in the desired ESD range of 10^6-10^{11} ohms
- Each measurement point on an injection-molded part can show different resistance values.
- The resistance of a parts inner layers is much lower than that of its surface layer.

Krefine's New Carbon Technology:

Our unique carbon materials and special compounding technology combine to produce products which overcome the problems listed above. Krefine has established a method of achieving easily controllable electrical resistance at specific levels even in the difficult region of moderate electrical resistance.

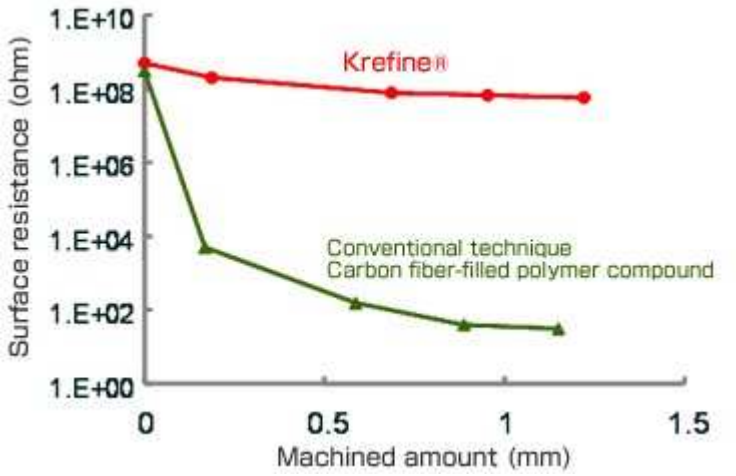
Through use of our new carbon technology it is possible to:

- Ensure the same resistance values at any measured point on the surface layer of a part.
- Consistently control and maintain the respective resistances of the skin and inner layers.
- By using several types of original Krefine carbon materials, any required resistance level can be achieved, even in the difficult dissipative range of 10^6-10^{12} ohms.



As illustrated in the graph above, Krefine's new technology results in consistent and controlled surface resistance for each point at specific levels within the range of 10^6 to 10^{11} ohm on an injection molded specimen. The surface resistance of a carbon fiber reinforced compound however, is highly variable versus that of the Krefine molded part. This variability is due to uneven distribution of the carbon fiber at the parts

surface from the shear forces involved in the injection process.



As illustrated above, the surface resistance of the inner layer of the carbon fiber filled compound is much lower than that of its skin layer. This is due to a deviation in the conductive filler population within the polymer. Specifically, the variable shear force distribution during injection molding results in uncontrolled and random fiber orientation in the base polymer, directly affecting the parts resistance values. Krefine's new carbon technology, however, is not affected by these shear forces which allows for consistent resistance values for the skin and inner layers whether in unfilled or fiber-reinforced compounds.

Professional Plastics supplies a full-range of static-controlled plastic materials in sheets, rods, tubes and films. For more information, please contact a customer service representative.

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