



Understanding ESD Properties for Polymer Design.

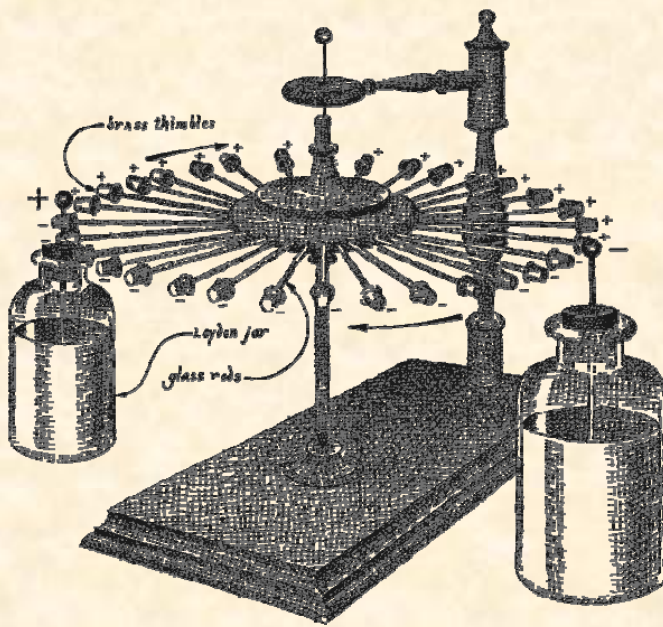
By Aardvark Polymers



Celebrating the first 25 years.
1983-2008

gapolymers.com

What is Static Electricity?



Benjamin Franklin's electrostatic motor

It's what the name implies -- electricity at rest. This electrical charge is the result of a transfer of electrons that occurs due to the sliding, rubbing, or separating of a material, which is a prime generator of electrostatic voltages -- e.g.: plastics, fiber glass, rubber, textiles, etc. Under the right conditions, this induced charge can build to 30,000 or 40,000 volts.

When this happens to an insulating material, such as a plastic, the built-up charge tends to remain in the localized area of contact. This electrostatic voltage then can discharge via an arc or spark when the plastic material comes in contact with a body at a sufficiently different potential, such as a person or microcircuit.

If electrostatic discharge (ESD) occurs to a person, the result can range anywhere from a mild to a painful shock. In extreme cases, ESD could even result in loss of life. Sparks are dangerous in an environment containing flammable liquids, solids or gases, such as in a hospital operating room or during the assembly of explosive devices.



Some micro-electronic parts can be destroyed or damaged by ESD as low as 20 volts. Since people are prime causes of ESD, they often cause damage to sensitive electronic parts, especially during manufacturing and assembly. The consequences of discharge through an electrical component sensitive to ESD can range from erroneous readings to permanent damage resulting in excessive equipment downtime and costly repair or total part replacement.

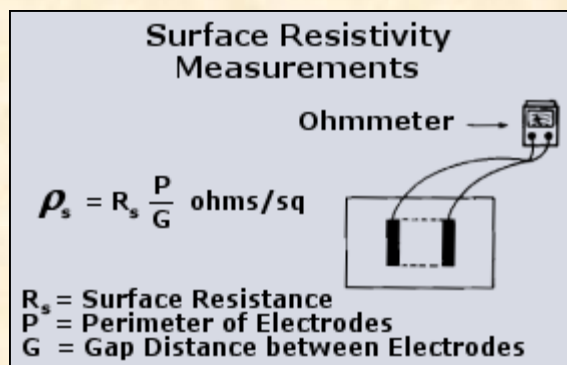
Resistivity Test Methods

Surface Resistivity

For thermoplastic materials intended to dissipate electrostatic charges, surface resistivity is the most common measurement of a material's ability to do so.

A widely accepted surface resistivity test method is ASTM D257. It consists of measuring the resistance (via an ohm meter) between two electrodes applied under load to the surface being tested. Electrodes are used rather than point probes because of the heterogeneous makeup of compounded thermoplastics. Simply touching the surface with a point contact may not give readings consistent with the overall part (readings of this type are often insulative even when the part is actually conductive).

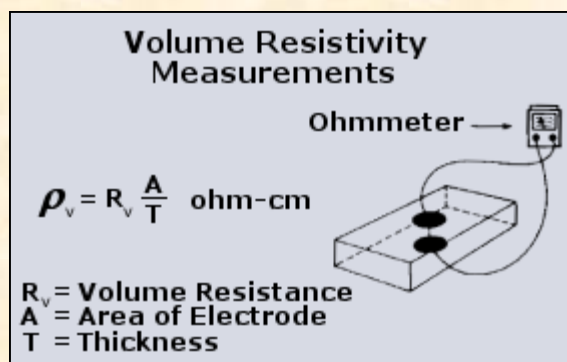
It is also important to maintain good contact between the sample and electrodes, which can require considerable pressure. The resistance reading is then converted to resistivity to account for the dimensions of the electrodes which can vary depending on the size and shape of the test samples. Surface resistivity is equal to resistance times the perimeter of the electrodes divided by the gap distance, yielding ohms/square.



Volume Resistivity

Volume resistivity is useful for evaluating the relative dispersion of a conductive additive throughout the polymer matrix. It can roughly be related to EMI/RFI shielding effectiveness in certain conductive fillers.

Volume resistivity is tested in a similar fashion to surface resistivity, however electrodes are placed on opposite faces of a test sample. ASTM D257 also refers to volume resistivity, and a conversion factor again based on electrode dimensions and part thickness is used to obtain the resistivity value from a resistance reading. [Volume resistivity is equal to resistance times the surface area (cm²) divided by the thickness of the part (cm) yielding ohm-cm.]



ESD Materials Categories

Materials for protection and prevention of ElectroStatic Discharge (ESD) can be categorized into three distinct groups -- separated by their ranges of conductivity to electrical charges.

Anti-Static:

Resistivity generally between 10^9 and 10^{12} ohms per square.

Initial electrostatic charges are suppressed.

May be surface resistive, surface-coated or filled throughout.

Static Dissipative (SD) :

Resistivity generally between 10^6 and 10^9 ohms per square.

Low or no initial charges -- prevents discharge to from human contact.

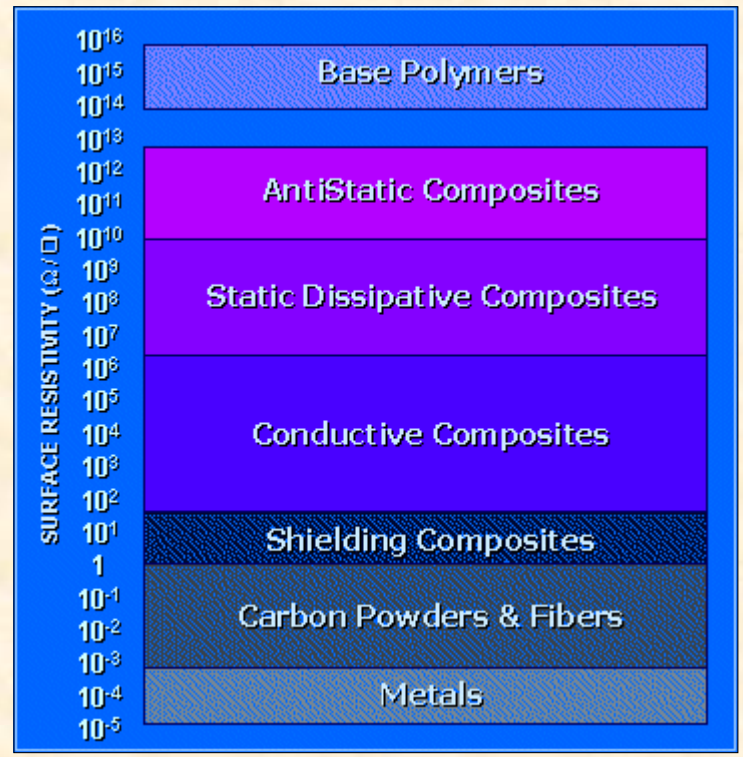
May be either surface-coated or filled throughout.

Conductive (CN) :

Resistivity generally between 10^3 and 10^6 ohms per square.

No initial charges, provides path for charge to bleed off.

Usually carbon-particle or carbon-fiber filled throughout.



Q: What is "ohms per square"?

see the following links:

<http://www.esdjournal.com/techpapr/ohmmtr/ohm.htm>

<http://www.esdjournal.com/techpapr/ohms.htm>

Aardvark Polymers would be pleased to create an ESD formulated polymer to meet your most demanding application.

For more information contact

Aardvark Polymers

+1-609-483-1013

info@aardvarkpolymers.com

www.aardvarkpolymers.com



Build up
your business

gapolymers.com

High Performance Polymers

Product, Process, Market, and Business Development



Celebrating the first 25 years.
1983-2008

Aardvark Polymers is an operational subsidiary of Gehrig & Associates