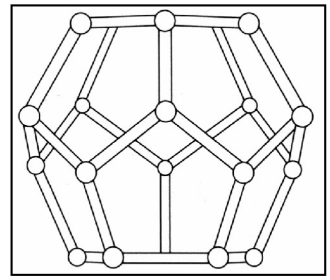
Zotefoams plc



Technical Information Sheet TIS 18
(previously BTI19)
Azote foams for Use with ESD Sensitive Devices

Introduction

Design of packaging for devices that are sensitive to electrostatic discharges (ESD sensitive) requires consideration of the physical requirements of the packaging material as well as its electrical properties. This bulletin aims to give an overview of the general classifications used for materials with regards to ESD protection and the standards that are most commonly used to characterise the materials.

Currently two different types of material are available in the Azote product range which have electrical properties that are suited for packaging of ESD sensitive devices. These are the conductive materials (CN grades) and the static dissipative grades (SD grades). For general information on these two grades please consult the technical information sheet TIS 16 (conductive foams) and TIS 17 (static dissipative foams).

Classification of material

Materials for packaging of ESD sensitive devices can be divided into three classes based on their electrical properties. The classification of materials shown in Figure 1 below is based on the definitions in ANSI/ESD S541-2003.

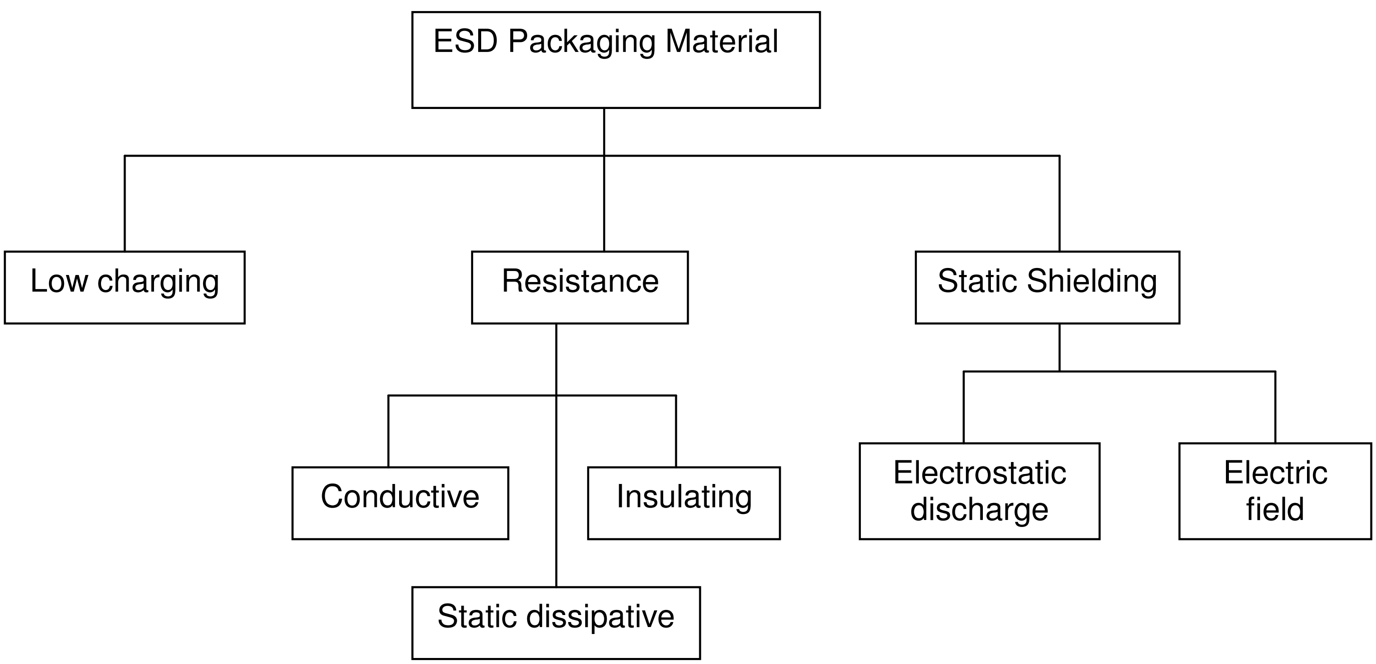


Figure 1: Classification of materials for ESD protection

Low charging materials were formerly known as antistatic materials. Materials in this class have reduced amounts of charge accumulation compared to standard packaging materials. The material is designed to reduce the charge accumulation from triboelectrification, i.e. the charge produced from contact and separation of materials.

The second class describes materials that are classed by their resistance properties. The ranges for each of the properties vary between different standards and values mentioned hereafter are taken from ANSI/ ESD S541-2003. Conductive materials are defined as materials with a surface or volume resistance of less than 1.0×10^4 Ω. Static dissipative materials have a surface or volume resistance of 1.0×10^4 Ω to 1.0×10^{11} Ω and materials with a volume or surface resistance greater or equal to 1.0×10^{11} Ω are classed as insulative materials. All Azote materials can be fall into one of these classes, CN grades being conductive, the SD grades static dissipative and normal grades insulative.

The third class includes materials that can shield sensitive devices from the effects of static electricity. These materials are capable of attenuating either an electrostatic discharge or an electric field when formed into a container.

Resistance and resistivity

The electrical properties of a material can be given either as the resistance of a material or as its resistivity. If the general test lay-out is know a value of resistance can be converted to the equivalent resistivity by a simple multiplication. The definitions below are taken from ASTM D 257-1993.

Surface resistance is defined as the ratio of the dc voltage applied to two electrodes applied to the surface and the current between them. The unit for surface resistance is Ω.

Surface resistivity is defined as the surface resistance of the material multiplied by that ratio of specimen surface dimensions (width of electrodes defining the current path divided by distance between electrodes) which transforms the measured resistance to that obtained if the electrodes had formed the opposite sides of a square. The unit of surface resistivity is Ω/sq. The size of the square is immaterial.

Volume resistance is defined as the ratio of the dc voltage applied to two electrodes (on or in a specimen) to the current in the volume of the specimen between the electrodes. The unit for volume resistance is Ω.

Volume resistivity is defined as the volume resistance of the material multiplied by that ratio of specimen volume dimensions which transforms the measured resistance to that resistance obtained if the electrodes had formed the opposite sides of a unit cube. The unit of volume resistivity is Ω.cm (sometimes written as Ω-cm).

Test methods

Several standards exist to which resistance and resistivity of ESD protection materials are measured. Over the years some test methods have been shown to be less reliant than others and the process of identifying a suitable measurement for each type of application is still ongoing. Conductive and static dissipative from products from the Azote product ranges are mainly used in packaging applications.

For measurements of the surface resistance of static dissipative planar materials, such as blocks of foam, ESD STM 11.11-2001 finds wide spread use. This standard is also referred to in ANSI/ESD S541-2003 and IEC 61340-5-1 describes an identical test method for measurement of surface resistance and surface resistivity.

Measurement of volume resistivity of foams is often performed to ASTM D991-89 (re-approved 2005). This standard is describing a test method for rubber products but has been found suitable for the measurement of other planar packaging materials. The standard is also referenced in the JEDEC standard JESD625-A.

No standard has yet been developed for low charging materials but guidance to understanding the triboelectric phenomenon and test methods currently used for tribo charge testing in static control for electronics can be found in ESD ADV 11.2.

For typical values of surface resistivity (SD material) and volume resistivity (CN materials please consult the relevant property datasheet. A summary of how Azote products fit into the ranges given in the various standards can be found on the respective bulletins for conductive foams (BTI-2) and static dissipative foams (BTI-14).

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ISO 9001:2000
FM 01870

ISO 14001
EMS 36270

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September 2006