

Antistatic Packaging

Masterbatch Prevents Electrostatic Charges and Has Approval for Food Contact Related Applications

Contact and friction with other materials can create a static charge on plastic surfaces. A sudden discharge can damage sensitive components. Now, a special masterbatch is able to prevent this with many plastics used in industrial applications. Not only is it suitable for automotive and industrial applications, it is also approved for use in food contact related applications.

In the processing industry, for example, defects in electronic components and computer chips can arise from electrostatically charged plastic packaging. The ignition of flammable liquids, vapors, and dusts endangers production plants, and presents health hazards for employees. After contact and rapid separation from other plastics, an electrostatic charge can build up on the initially electrically neutral surface of a polymer. Without suitable dissipation, an uncontrolled and sudden discharge can occur. This risk is counteracted by the antistatic Elastostat masterbatch produced by BASF Polyurethanes GmbH

in Lemförde, Germany, which is based on thermoplastic polyurethane (TPU).

Most polymers exhibit insulating properties and are therefore susceptible for electrostatic charging. By adding the masterbatch, these materials can be made antistatic. The antistatic effect is permanent, and no special ambient requirements such as specific air humidity must be ensured. Moreover, product processing is simple. The masterbatch combines very well with standard plastics such as polyethylenes (HDPE and LDPE), polypropylene (PP), polystyrene (PS) or acrylonitrile-butadiene styrene

(ABS). It has been approved for applications involving foodstuffs contact according to both EU 10/2011 and FDA. This permits a wide range of applications, e.g. in LDPE films, PE pipes, as well as PS panels.

Reducing Surface Resistance

When processed as a dry blend without an additional processing step, the masterbatch exhibits good homogeneity, eliminating the need for compounding. Depending on application requirements, 5 to 20% by volume of the antistatic TPU masterbatch is recommended. There is no negative influence on the properties of the matrix materials. Impact strength and flexibility may even be improved by adding Elastostat. The antistatic additive and therefore masterbatch colorless, allowing the base material to be colored at will.

Plastics with defined electrical properties can permanently dissipate electrostatic charges in a controlled manner. Hereby, the specific surface resistance is a decisive characteristic for assessing a material's electrostatic charging or discharging properties. The technical guideline for hazardous goods TRGS 727 "Avoidance of ignition hazards due to electrostatic charges" classifies the electrostatic properties of materials in terms of conductive, dissipative, and insulating. Conductive materials have a surface resistance less than $10^4 \Omega$. These materials dissipate accumulated charges within the shortest time, so that, for example, sensitive electronic components are not damaged. Materials with a surface resistance of more than »



Suction and conveyor hoses can be made antistatic with Elastostat. This prevents the transported goods becoming electrostatically charged (© BASF)

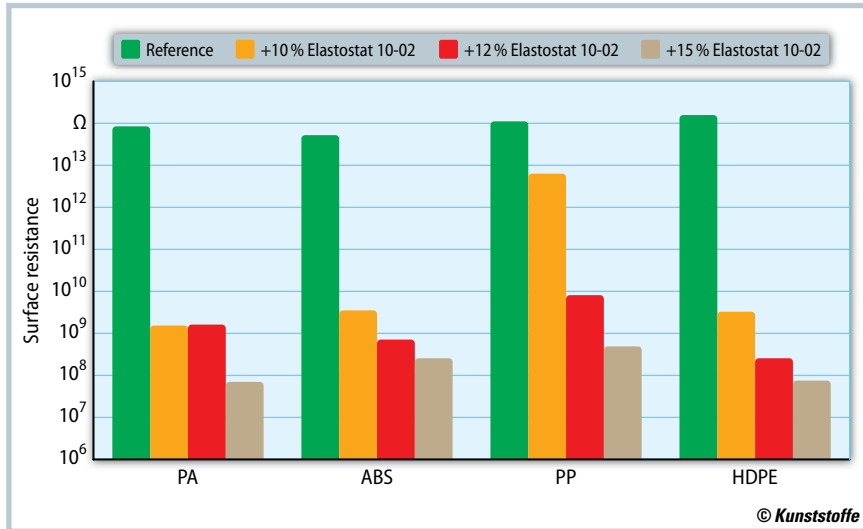


Fig. 1. Comparison of surface resistance with/without antistatic masterbatch. Below $10^4 \Omega$, a material is classified as conductive, above $10^{12} \Omega$ it is insulating (source: BASF)

$10^{12} \Omega$ are insulating. Most plastics are insulators (example: synthetic fiber sweaters), which can be charged electrostatically simply by friction. Due to their very poor conductance, the generated charges remain on the surface for a long time, so that charges of several thousand volts are possible. Materials with a surface resistance between 10^4 and 10^{11} (measured at 23°C with 30% relative air humidity) are described as dissipative. Materials that cover this range, such as e.g. Elastostat, are described as IDPs (intrinsic dissipative polymers) (Fig. 1).

Antistatic Properties for Industrial Packaging

Apart from automotive applications, Elastostat is also suitable for polyolefinic industrial packaging. Antistatic properties are indispensable for containers for the transport of flammable liquids or dust-like goods, for example "big bags", plastic drums and canisters, as well as intermediate bulk containers (IBC) (Fig. 2). The most common versions of IBCs consist of an inner polyethylene container, an outer metal tube frame, and a pallet. Such containers for chemicals, foodstuffs, cosmetics, and pharmaceuticals can be produced more efficiently by using a masterbatch. Sensitive electronic components must be especially well protected to avoid damage from electrostatic charges or high-voltage spikes due to sudden discharges. In both cases, corresponding transport systems fitted with the antistatic Elastostat

stat10-02 masterbatch provide reliable protection. Packaging can include transport boxes and trays for small electronic components such as microchips, and air cushions or ziplock bags for mobile phones, circuit boards, disk drives or other electronic devices.

BASF's thermoplastic polyurethane, Elastollan is used in numerous application fields in the automation industry. Apart from the demanding mechanical property and flexibility requirements in applications involving conveyor hoses or belts, the electrostatic charging of the transported goods must also be prevented (Title figure). Due to the base polymer used, Elastostat has an outstanding compatibility with Elastollan. Very good antistatic properties are achieved even with low dosing. The TPU's basic mechanical properties remain largely unaffected after adding the masterbatch. With its Elastostat masterbatch, BASF offers a specialized product which is easy to process. The masterbatch provides permanent antistatic behavior, good mechanical properties, and can be combined with polar and non-polar polymers. Since Elastostat is colorless, it is easily colored. In extensive tests, the experts at BASF have tested the antistatic effect as well as compatibility. Currently, Elastostat is being tested in numerous different application areas, numerous base polymers. ■



Fig. 2. Intermediate bulk containers (IBC) – used e.g. for the industrial transport of liquids – are an important application area for Elastostat (© BASF)

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