Continuing to Deliver Static Prevention Performance in a Wide Range of Fields from Dust Prevention to Explosion-proofing

Polymer-type Permanent Antistatic Agent 'PELESTAT' Series and 'PELECTRON' Series

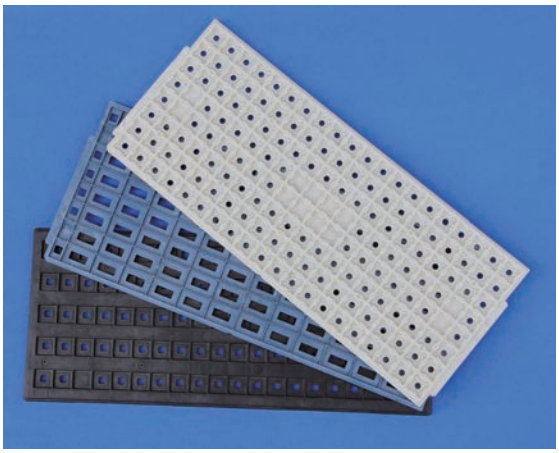
In an explosion-proof helmet

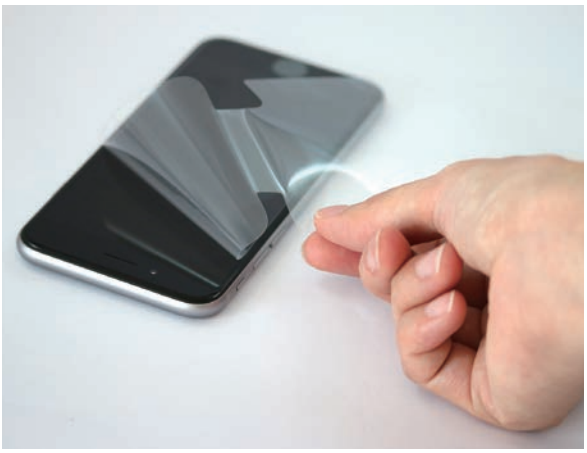
While plastics are used widely in every corner of our society, they are generally electrically insulative, and accumulate static charge. The accumulated static charges can cause discoloration due to the attraction of airborne dust. Also, static charge buildup can cause problems such as malfunctions and system failures in electronic devices. Lastly, static charge buildup can ignite fires or dust explosions. These problems can be prevented through the use of permanent polymeric antistatic additives which dissipate built-up static charges at a controlled rate.

Static prevention in plastics

While there are static prevention methods for plastics that are based upon application of surfactants to the plastic surface or compounding into the plastic, these methods have disadvantages. One disadvantage is poor permanence, as seen when the plastic is washed in water or wiped. As agents that can solve these problems and add antistatic performance permanently, polymer-type permanent antistatic agents that contain conductive units (hydrophilic segments) have come into the spotlight.

In 1994, Sanyo Chemical released the polymer-type antistatic agent 'PELESTAT,' which we developed with our proprietary technology using a hydrophilic polyether-based block polymer. It has been well- received for its





In protective films and IC trays

■ Levels of specific surface resistance value, purposes of use, and application examples

Specific surface resistance value (Ω/sq.)	Charging phenomenon	Purpose of using antistatic agent	Application example
10^{12}～10^{13}	It becomes charged but slowly attenuates	Prevention of dust adhesion	Automobile interiors, household appliances, building materials
10^{10}～10^{12}	It becomes charged but attenuates immediately	Prevention of malfunction	OA devices, electronic packing materials, IC trays, protective films
10^{8}～10^{9}	No charging	Discharge measure, explosion-proofing	Inner bag in flexible container bags, antistatic mats, components for medical purposes

Static prevention range: 10^{8} to 10^{13} Ω/sq.

excellent features, which are [1] delivery of a permanent antistatic effect immediately after forming, [2] no deterioration in the properties intrinsic to the resin such as mechanical and surface properties, [3] excellent compatibility with various resins resulting in a wide range of resins with which it can be used, [4] excellent thermal stability and no deterioration in the heat resistance of the final product, [5] delivery of high antistatic effect even in dry environments, and [6] capacity to allow bright coloring.We have also developed 'PELECTRON' offering improved static dissipation while maintaining the outstanding features of 'PELESTAT.'

'PELECTRON' is a product whose composition was designed so that it has even lower surface resistivity, by further enhancing the technology of static prevention with a polyether-based block polymer. Furthermore, we have successfully developed a technique to form stripe-shaped conductive circuits efficiently in the surface layer of the plastic by controlling the properties of the antistatic agent, such as compatibility and melt viscosity. These further widen the fields of its application.

Expanding fields of application

To expand their applications further, Sanyo Chemical has added to its lineup of subject resins since the release of the polymer-type antistatic agents (see the table on Page 3). We have accumulated dispersion control techniques in various different resins, and in doing so, achieved its use in applications where it had been difficult to deliver satisfactory performance with the conductive unit not

■ Major products in 'PELESTAT' Series and 'PELECTRON' Series

Product name	PELESTAT NC6321	PELESTAT 300	PELESTAT 230
Composition	Polyamide/polyether copolymer	Polyolefin/polyether copolymer	
Appearance	Pale yellow pellets	Pale yellow pellets	Pale yellow pellets
Melting point (°C)	Approx. 203	Approx. 135	Approx. 163
Thermal decomposition start temperature (°C)	Approx. 285	Approx. 240	Approx. 250
MFR [g/10min]	Approx. 20 (215°C, 21.18 N)	Approx. 30 (190°C, 21.18 N)	Approx. 12 (190°C, 21.18 N)
Specific surface resistance value*1 (Ω/sq.)	1×10^9	1×10^8	5×10^7
Refractive index	Approx. 1.515	Approx. 1.495	Approx. 1.495
Subject resin*2	ABS, PC/ABS, nylon, etc.	PP, PE (injection molding)	PP, PE (extrusion molding)
Features	Mainly for injection molding of resin parts, etc. Highly compatible with styrene-based resins	Mainly for injection molding of containers, etc. Highly compatible with olefin-based resins	Mainly for extrusion molding of films, sheets, etc. Highly compatible with olefin-based resins

Product name	PELECTRON AS	PELECTRON PVL
Composition	Polyamide/polyether copolymer	Polyolefin/polyether copolymer
Appearance	Pale yellow pellets	Pale yellow pellets
Melting point (°C)	Approx. 195	Approx. 135
Thermal decomposition start temperature (°C)	Approx. 285	Approx. 250
MFR [g/10min]	Approx. 30 (215°C, 21.18 N)	Approx. 15 (190°C, 21.18 N)
Specific surface resistance value*1 (Ω/sq.)	4×10^6	3×10^6
Refractive index	Approx. 1.505	Approx. 1.495
Subject resin*2	ABS, PC/ABS, PC, nylon, etc.	PP, PE (extrusion molding)
Features	Mainly for injection molding of resin parts, etc. Highly compatible with styrene-based resins	Mainly for extrusion molding of films, sheets, etc. Highly compatible with olefin-based resins

*1 Measured with a super megohmmeter after preparation of a test plate (23°C, 50% R.H.)
*2 ABS = Acrylonitrile-butadiene-styrene, PC = polycarbonate, PP = polypropylene, PE = polyethylene

becoming well-oriented on the surface.

[Dust prevention]

In clean rooms, etc. where dust is not desired, antistatic performance is required even in floor mats and soles of the shoes.By enabling application in elastomers, which had been conventionally difficult, applications expanded to floor mats, soles of shoes, etc. Then, by further improving the dispersion techniques for 'PELESTAT' and 'PELECTRON' to respond to the needs of the thin film field, including the surface films on liquid crystal displays and various films that are used as packaging materials, we successfully developed a technique to efficiently form conductive circuits in the surface layer without losing the transparency of the plastic.

[To ensure safety]

Another application that requires low resistance is the explosion-proofing application that prevents explosions caused by sparks. If we can add static prevention properties to explosion-proof helmets to be used in coal mines, factories, etc., or the inner linings of FIBC (bulk bags) that carry large amounts of powder such as flour in order to prevent dust explosion, there will be no need to attach ground wires, and their formability will improve. Since 'PELECTRON' has a small specific surface resistance value at 10^6 Ω, it can add to the static prevention property required in explosion- proofing applications.

The demand for polymer-type antistatic agents is also expanding from advanced countries to ASEAN countries and emerging countries called the BRICs; Sanyo Chemical will continue to develop our products while cultivating greater future demands.