Heebut Materials

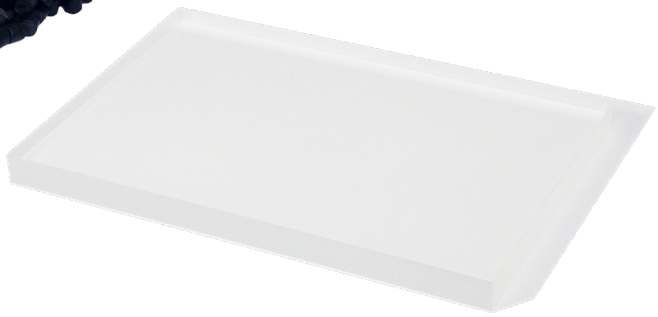
ACL Staticide®

ESD Packaging & Materials

Staticide® QuantumTube® Additives

Carbon Nanotube Thermoplastics

Thermoform Films, Rigid Sheets, & Paper



ACL Inc has partnered with Heebut Materials to introduce a range of exciting new ESD solutions using carbon nanotube technology. Integrating single- or multi-walled carbon nanotubes, Staticide® QuantumTube® products achieve exceptional electrical conductivity at low loading levels, making them the natural choice for creating groundbreaking new ESD products and solutions.

Single Walled Carbon Nanotube (SWCNT) Coated Thermoform Films, Rigid Sheets, & Paper

Crystal clear, permanently dissipative ESD coating

Staticide® QuantumTube® Single-walled Carbon Nanotube Coated Thermoform Films, Rigid Sheets, and Paper are custom manufactured materials that provide cutting-edge electrostatic discharge (ESD) protection with a proprietary optically clear SWCNT coating. Manufactured on demand to your specifications, these custom materials demonstrate excellent clarity, toughness, chemical resistance, and stability during processing, ensuring permanent anti-static properties regardless of humidity. Contact info@aclstaticide.com for clarity on your next project!

Thermoform Film (TF)	Thickness	Width	Surface Resistivity	Surface Resistance	Specific Gravity	Light %T	Haze
TFBOPET	Custom	Custom	10^6-10^8 Ω/sq	10^6-10^8 Ω	1.399 g/cm³	≥ 88 %	≤ 5.5 %
TFPETG	0.2-2.0 mm	390-1000 mm	10^6-10^8 Ω/sq	10^6-10^8 Ω	1.27 g/cm³	≥ 85 %	≤ 3.0 %
TFAPET	0.15-1.5 mm	100-1200 mm	10^6-10^8 Ω/sq	10^6-10^8 Ω	1.35 g/cm³	≥ 80 %	≤ 5.0 %

Rigid Sheets (RS)	Width	Length	Thickness	Surface Resistance	Hardness	Cross-Cut
RSPC	Max 48 in	Max 96 in	Samples 3/8 in	10^6-10^8 Ω	4H	5B
RSPMMA	Max 48 in	Max 96 in	Samples 3/8 in	10^6-10^8 Ω	4H	5B

Custom Coated Paper	Material Base	Color	Roll Width	Surface Resistance
QEPC	Custom	Custom	Max 1.2 m (4 ft)	Conductive: 10^3 - 10^5 Ω, Dissipative: 10^5 - 10^7 Ω

Multiwalled Carbon Nanotube Thermoplastics

Easy-to-use ESD thermoplastic masterbatches and ready-to-use full compounds

Staticide® QuantumTube® Thermoplastics are designed for exceptional electrical conductivity and electrostatic discharge (ESD) applications. Unlike carbon black or carbon fiber plastic additives, multi-walled carbon nanotubes (MWCNTs) offer superior electrical conductivity and high flow efficiency even at lower loading levels, making them an excellent choice for injection molding and extrusion processes. See below for full compound specifications and facing page for masterbatch compounding information and processing parameters.

Ready-to-Use Full Compound Specifications						
Compound (CM)	**Drying Guidelines**	**Processing Temperature Range**	**Gravity density (g/m³, 23 °C)**	**Tensile Strength (MPa, 50mm/min)**	**Elongation at Break (%, 50mm/min)**	**Flexural Strength (MPa, 2mm/min)**
CMPP	2-3hr @ 80-90°C	180-220 °C	< 1	≥ 20	≥ 100	≥ 20
CMPVC	2-3hr @ 60-70°C	170-200 °C	< 1	≥ 8	≥ 300	

Compound (CM)	Flexural Modulus (MPa, 2mm/min)	Volume Resistance (Ω•cm, ISO 3915)	Notched Impact Strength (kJ/m², V-Shaped, 4mm)	Melting Index (g/10 min, 2.16 kg)	Shore Hardness A	Surface Resistance (Ω)
CMPP	≥ 800	≤ 100	≥ 50	6.5 @ 230 °C		150-170
CMPVC				16 @ 190 °C	80	

MWCNT Thermoplastic Masterbatches

Multi-walled carbon nanotube (MWCNT) thermoplastic masterbatches provide manufacturers with the greatest flexibility. Compounds created with these masterbatches must be processed twice to ensure adequate mixing. In the chart below, the columns with matching color refer to the resulting compound properties provided a given let down.

Reference Guidelines for Full Compounding

Masterbatch (MB)	CNT wt% (±1)	Let Down Ratio (Base:MB) / Resulting CNT wt%	Tensile Strength (MPa)				Elongation at Break (%)				Flexural Strength (MPa)				Flexural Modulus (MPa)				Izod Impact (kJ/m2)				Surface Resistivity (Ω/sq)			
MBTPU	16.0	5 / 6 / 7 / 8																					$6.8e^8$	$7.2e^7$	$1.5e^6$	$4.5e^5$
MBPPO	15.0	7.5 / 3.75 / 2.5 / 0 / 2 / 4 / 6	40.7	45.9	52.0	54.9	4.3	3.8	3.2	2.2	78.3	86.3	90.9	91.5	2223	2510	2766	3081	21.5	8.5	5.7	4.6	$>1.0e^{13}$	$5.2e^{12}$	$2.0e^8$	$6.8e^4$
MBPP	20.0	10 / 5 / 3.3 / 0 / 2 / 4 / 6	21.4	21.5	21.9	21.9	10.3	18.4	19.3	30.3	41	42.7	43.4	44.4	1512	1521	1528	1555	14.6	18.65	13.1	13.4	$>1.0e^{13}$	$>1.0e^{13}$	$7.7e^9$	$3.6e^7$
MBPC	15.0	7.5 / 3.75 / 2.5 / 0 / 2 / 4 / 6	57.2	60.9	63.1	67.2	40.0	23.6	14.8	6.5	94.6	97.4	99.7	102.6	2155	2359	2590	2896	59.6	12.4	4.9	3.2	$>1.0e^{13}$	$3.0e^{10}$	$8.7e^5$	$1.3e^4$
MBPA6	15.0	7.5 / 3.75 / 2.5 / 0 / 2 / 4 / 6	40.7	43.8	46.3	49.2	4.3	3.4	3.1	2.5	78.3	81.6	83.3	85.0	2223	2281	2651	2787	21.5	9.8	7.2	5.1	$>1.0e^{12}$	$>1.0e^{12}$	$4.0e^8$	$2.0e^6$
MBLLDPE	20.0	10 / 5 / 3.3 / 0 / 2 / 4 / 6	11.3	13.0	13.9	14.3	106	76	47	39	15.5	18.3	18.5	19.9	382	467	486	541	46.1	15.8	12.1	8.9	$>1.0e^{12}$	$>1.0e^{12}$	$8.0e^8$	$1.0e^5$
MBHIPS	15.0	6 / 7 / 8 / 9																					6.8^8	$5.6e^6$	$5.2e^5$	$3.2e^4$
MBAS	20.0	4 / 5 / 6 / 7																					$2.3e^8$	$4.7e^6$	$5.2e^4$	$1.2e^4$
MBPEG	70.0																									

Twin-Screw Mixing and Twin-Screw Extrusion Reference Parameters

Masterbatch (MB)	L/D Ratio	Screw Combination	Extrusion Screw Temperatures (°C)			
			Feeding	Melting	Mixing	Pumping
MBTPU	≥45	Medium	80-100	150-170	170-200	180-190
MBPPO						
MBPP	≥45	Medium	100-120	160-190	190-220	190-210
MBPC	≥45	Medium	120-150	220-250	240-270	240-260
MBPA6	≥45	Medium	120-150	230-250	250-270	240-260
MBLLDPE						
MBHIPS	≥45	Medium	100-120	160-190	200-230	190-220
MBAS	≥45	Medium	100-120	160-190	200-230	180-200
MBPEG						

Injection Molding Reference Parameters

Masterbatch (MB)	Drying Parameters	Mold Temperature	Injection Temperatures (°C)			
			Nozzle	Rear	Middle	Front
MBTPU	80°C, 2-3 hrs	40-60°C	190-200	180-210	170-190	150-170
MBPPO						
MBPP	80°C, 2-3 hrs	50-80°C	220-230	200-240	180-220	160-190
MBPC	80°C, 2-3 hrs	80-120°C	260-270	270-290	260-280	250-270
MBPA6	80°C, 2-3 hrs	80-120°C	250-270	260-280	250-270	240-260
MBLLDPE						
MBHIPS	80°C, 2-3 hrs	60-80°C	230-240	230-250	200-220	180-200
MBAS	80°C, 2-3 hrs	60-80°C	240-250	230-260	200-230	180-200
MBPEG						

Single Walled Carbon Nanotube Additives

Unlocking a new era of ESD coating technology

Staticide® QuantumTube® Single Walled Carbon Nanotube Additives are concentrates in a variety of carriers for developing products that require superior electrical conductivity, electrostatic discharge (ESD), and antistatic properties. When diluted in the final product they are optically transparent, enabling the creation of groundbreaking new ESD coatings and products. Dust-free and safe to handle as compared to CNT or carbon black powders (see SDS for details), they're simple to integrate into existing production workflows as they require no process change, just to be mixed with the other coating ingredients according to the dispersion guide. Samples are available in 100-200g weights.

HBSW1 Water-based Suspension - Water and latex-based coatings, glove and PPE manufacturing
HBS1 Dust-free Soft Flake - Epoxy, Polyurethane, and Polyaspartic coatings, Urethane Cements, more!
HBS18 EGDE-based Concentrate - Epoxy, Polyurethane, and Polyaspartic coatings, Urethane Cements

Material Properties		HBSW1 Water-based Suspension	HBS1 Dust-free Soft Flake	HBS18 EGDE-based Concentrate
Color		Black	Black	Black
Appearance		Liquid	Soft Flake	Gel-like
Density		1.0 g/cm³	1.05 g/cm³	1.1 g/cm³
pH		8-11		6-7
Moisture			< 1%	
Composition (wt. %)	SWCNT	0.4%	10%	1%
	Carrier	Water - 98.6% Surfactant - 1.0%	Epoxypropyl neodecanoate - 90%	Epoxypropyl neodecanoate - 9% Ethylene glycol diglyceryl ether - 90%

HBSW1

HBS1

HBS18

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