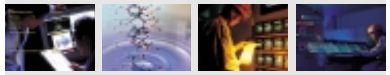
PS



Product Introduction

Having not only high strength and mold ability but also excellent secondary process ability in terms of dimensional and thermal stability, color ability, adhesion and paint ability, polystyrene resin is considered one of the five major general purpose resins, widely used for various electrical appliances, structural components, general merchandise, etc.

As a non-crystalline resin possessing various properties, such as PE, PP, etc. in molecular structure, polystyrene resin shows no change in properties and dimensions for changes in the degree of crystallinity.
Furthermore, having a low melt viscosity, it is not easily decomposed by heat, processing, thermoforming and expanded forming.

Generally, polystyrene resin is divided into two categories: General Purpose Polystyrene (GPPS) and High Impact Polystyrene (HIPS), with or without "impact modifiers"

GPPS, which can be polymerized by heat or chemical initiators, has high stiffness and high transparency compared with PE, PP and PVC. So-called, Crystal Polystyrene is a clean polymer that exhibits high stiffness, good dimensional stability, low specific gravity and excellent electrical properties.

Transparency, residual monomer content and molecular weight are very important factors in determining the properties of GPPS and should be considered when selecting a grade.

Kumho GPPS has good transparency, mold ability, and heat stability; therefore, processing by injection molding or extrusion molding is very economical.

GPPS has excellent transparency and stiffness but very low impact resistance. HIPS is a resin that provides enhanced impact strength through rubber-grafting. Rubber toughening makes possible a wide range of properties depending on rubber content, morphology, size, degree of grafting, molecular weight of matrix PS, and other conditions.

Kumho HIPS has excellent impact strength, mold ability and heat-resistance. Its wide range of grades with various melt flows and impact strengths allows the selection of the appropriate grade for a specific application. Furthermore, Kumho HIPS has excellent process ability for various molding techniques and also excellent secondary process ability, such as adhesion.

Characteristics & Applications

GPPS(General Purpose Polystyrene)

Because Kumho GPPS resins possess excellent transparency, mold ability, heat stability and low specific heat, they are very economical in injection or extrusion processes. In addition, because they are available in various grades, the range of choice is very wide, depending on use. Grades are classified depending on manufacturing method, in other words, changes in processing conditions or quantity of additives. There are general purpose, high flow, high heat resistance, high rigidity, extrusion molding and high transparent grades.

GPPS

Grades	Characteristics	Applications
GP 125 GP 125S GP 125EI	Standard Flow General Purpose Excellent Demoldability	Kitchen utensils, Cosmetic case, Dust covers for electronic equipment, etc.
GP 100	High Flow High Transparency	Disposable cups, Small containers, Micellaneous goods, etc.
GP 150	Heat Resistance High Rigidity	Refrigerator food trays, Humidifiers, Optical parts, Lighting equipment cassette tape cases, boad, etc.
GP 125EB GP 125BL	High Strength	PSP (Tray, Cup)
GP 150K	Excellent Transparency	Vegetable container of refrigerator, Humidifiers, Refrigerator crisper, Optical instruments, Lighting apparatus, PSP(Tray, Cup), etc.

HIPS(High Impact Polystyrene)

Kumho HIPS resins have excellent impact resistance, mold ability and heat stability. In addition, as they have a wide range of melt flow and impact strength, they can provide a range of choices, depending on their use: general purpose grade, high flow grade, high heat resistance grade, extrusion molding grade, blow molding grade, high gloss grade, transparent grade and other special grades. Besides, their very high mold ability, they provide excellent productivity in various fabricating systems, such as extrusion, injection and other secondary processes.

HIPS

Grades	Characteristics	Applications
HI 425	General Purpose	Office equipment, Electronic home appliances, Toys, Kitchen utensils, Miscellaneous goods, etc.
HI 425TVG HI 425TVL	High Flow Super High Flow	TV cabinet for low pressure gas injection molding, Key board, etc.
HI 425TV HI 425TVD	High Impact Strength High Heat Resistance	TV cabinet, Humidifier, Typewriter, Audio housings, Sports equipment, OA equipment, etc.
HI 425E	Extrusion	Refrigerator inner liners, Door liners, Disposable cups, Food packing sheet, Wrapping films, Trays, Washing machines, etc.
HI 425EH	Cold Resistance Extrusion	
HI 425EP	ESCR	
HI 450PG HI 450S	High Gloss Super High Gloss	PC swivel, Washing machine cover, Leisure table, Office equipments, Air conditioner, Electric fan body, Electronic home appliance, etc.
HI 410T	High Impact Transparent	Transparent sheets for food containers, Tray, Disposable cups, Packaging for electronic parts, etc.
HI 420T		Audio, Video housing, Casset CD player, CD case, Computer vessel, Mouse, Keybord, Washing machine, Various injection molded goods, etc.
MIB IT	High Impact Strength Demoldability	Disposable cups, Yogurt beverage bottles, etc.
MIB 237	Demoldability Thin-Walled Moldability	

Typical Properties (GPPS & HIPS)

Test Item/Unit	Test Method (ASTM)	Test Condition	GPPS								HIPS												
			GP 125 Standard Flow	GP 125S General Purpose	GP 125 EI Excellent Demoldability	GP 100 High Flow High Transparency	GP 150 Heat Resistance High Rigidity	GP 125 EB High Strength	GP 125 BL High Strength	GP 150 K Excellent Transparency	HI 425 General Purpose	HI 425 TVG High Flow	HI 425 TVL Super High Flow	HI 425 TV High Impact Strength	HI 425 TVD High Heat Resistance	HI 425 E Extrusion	HI 425 EP ESCR	HI-425 EH Cold Resistance Extrusion	HI 450 PG High Gloss	HI 450 S Super High Gloss	HI 410 T High Impact Transparent	HI 420 T High Impact Transparent	MIB IT High Impact Strength Demoldability	MIB 237 Thin-Walled Moldability
Tensile Strength (Kg/㎠(psi))	D638	23℃	460 (6,530)	470 (6,670)	460 (6,530)	440 (6,250)	530 (7,530)	480 (6,820)	520 (7,380)	540 (7,670)	280 (3,980)	250 (3,550)	250 (3,550)	300 (4,260)	270 (3,830)	300 (4,260)	220 (3,120)	250 (3,550)	350 (4,970)	370 (5,250)	405 (5,750)	380 (5,400)	250 (3,550)	285 (4,050)
Elongation(%)	D638	5㎜/min	2.0	2.0	2.0	2.5	2.5	2.0	2.5	3.5														
		50㎜/min									55	50	40	45	50	45	60	55	30	25	30	35	35	30
Flexural Strength (Kg/㎠(psi))	D790	23℃	580 (8,240)	680 (9,660)	580 (8,240)	500 (7,100)	880 (12,210)	680 (9,660)	800 (11,380)	890 (12,640)	300 (4,260)	290 (4,120)	300 (4,260)	350 (4,970)	330 (4,690)	350 (4,970)	260 (3,690)	310 (5,146)	430 (6,100)	440 (6,250)	430 (6,100)	380 (5,400)	350 (4,970)	380 (5,400)
Flexural Modulus (Kg/㎠(psi))	D790	23℃	29,200 (414,640)	29,300 (416,080)	29,700 (421,740)	28,000 (411,800)	30,500 (433,100)	30,000 (426,000)	29,500 (418,900)	33,000 (456,400)	17,000 (241,400)	16,500 (234,300)	16,500 (234,300)	17,500 (248,500)	16,500 (234,300)	17,500 (248,500)	16,500 (234,300)	17,000 (241,400)	23,000 (326,600)	23,000 (326,600)	19,500 (276,900)	16,100 (228,620)	17,000 (241,400)	19,000 (269,800)
Rockwell Hardness	D785	M scale	74	75	74	74	75	74	74	75														
		L scale									60	60	60	64	60	64	40	55	75	75	78	11	60	70
IZOD Impact Strength (Kg·㎝/㎝ (ft·lb/in))	D256	3.2㎜, Notched, 23℃(73℉)	1.5(0.27)	1.5(0.27)	1.5(0.27)	1.5(0.27)	1.5(0.27)	1.5(0.27)	1.5(0.27)	1.5(0.27)	9.0(1.62)	10.0(1.80)	9.5(1.71)	10.0(1.80)	10.0(1.80)	10.0(1.80)	13.0(2.34)	11(1.98)	9.0(1.62)	8.5(1.53)	2.5(0.45)	2.5(0.45)	9.0(1.62)	9.0(1.62)
Heat Distortion Temp(℃(℉))	D648	18.6㎏/㎠(264psi) Unannealed	80(176)	80(176)	82(180)	80(176)	87(189)	84(187)	87(189)	87(189)	75(167)	76(168)	75(167)	80(176)	77(172)	78(174)	75(167)	75(167)	81(178)	81(178)	81(178)	77(171)	75(167)	74(165)
Vicat Softening Temp(℃(℉))	D1525		99(210)	98(208)	99(210)	94(201)	105(221)	102(216)	105(221)	105(221)	93(199)	97(207)	98(210)	99(210)	97(207)	97(207)	98(208)	97(207)	97(207)	99(210)	105(221)	100(212)	97(207)	98(208)
Melt Flow Index (g/10min)	D1238	200℃, 5㎏	9.0	7.0	9.5	14.0	4.5	6.5	4.5	3.0	9.0	9.5	13.0	4.5	6.5	4.5	5.5	4.5	7.0	7.0	7.5	8.0	8.5	8.5
Molding Shrinkage(%)	D955		0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6
Specific Gravity	D792		1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Water Absorbtion(%)	D570	24hr, Immersion in water	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Dielectric Strength (V/㎜)	D149		550	550	550	550	550	550	550	550	450	450	450	450	450	450	450	450	450	450	450	450	450	450
Volume Resistivity (Ω·㎝)	D257		10^{15}	10^{15}	10^{16}	10^{16}	10^{16}	10^{16}	10^{16}	10^{16}	10^{16}	10^{16}	10^{16}	10^{16}	10^{16}	10^{16}	10^{16}	10^{16}	10^{16}	10^{16}	10^{16}	10^{16}	10^{16}	10^{16}
Flammability(Rating)	UL94*	1/16"(1.6㎜)	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB
		1/12"(2.2㎜)	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB
		1/8"(3.2㎜)	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB

(*) UL File No. E654224 (CSA File No. LR86457)
Note 1) These are typical property values, not specifications.
Note 2) In case of colored products, the values could vary slightly by color.
Note 3) Values are measured at 23℃ and in RH of 50% on injection molded specimens.