

SHINKONG™

SHINITE® PBT

For Loose Tube

新光合成纖維股份有限公司

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Introduction

For optical fiber loose tube, the most common feedstock is PBT. In terms of hydrolysis resistance ability, PBT is inherently inferior to Nylon 12. However, Shinkong successfully improves hydrolysis resistance performance on **SHINITE® PBT loose tube grade** and received recognition from most major manufacturers for optical fiber loose tube. That's why **SHINITE® PBT loose tube grade** is your best choice for optical fiber loose tube feedstock.

Currently Shinkong provides several grades on loose tube application, including:

SHINITE® D201G00NA DK5006 – IV 1.20

SHINITE® D201000NA DHK011 – IV 1.20, economical grade

SHINITE® D201G00NA DK5016 – IV 1.25

SHINITE® D201G00NA DK5130 – IV 1.30

SHINITE® D201G00NA DK5138 – IV 1.38

Properties

For optical fiber loose tube application, the feedstock must contain following properties:

- High Melt Strength
- High Dimensional Stability
- High Toughness
- High Hydrolysis Resistance Ability
- High Chemical Resistance Ability
- Low Thermal Expansion Coefficient
- Low Hygroscopic

Shinkong provides **SHINITE® PBT loose tube grade** which fits exactly all requirements mentioned above.

Production Notice

In normal cases, it's recommended to dry at 100 Celsius degree for 2 hours for brand new product to make sure the moisture content of PBT is lower than 300 ppm (0.03%) before production. In cases of torn package, it's recommended to dry at following conditions:

(°C)	120°C	130°C	140°C
Hours	4	3	2

Extruder temperature : 230°C 、 235°C 、 240°C 、 240°C 、 230°C 、 230°C

Recommended cooling water temperature : 15°C~50°C

Screw : 65φ , 25D

L/D ≥ 24

Compression rate : 2.5~3.5 : 1

Draw Down Ratio ≤ 10:1

Speed : 40m/min(38φ->100m/min)

Amp : 57~61

Basic Properties

Table 1. Basic Properties of SHINITE® PBT loose cable standard grade – DK5006

	Unit	Test Method		Values	
Mechanical properties					
Izod Impact(Notched)	Kg-cm/cm	ASTM	D256	7	
Tensile Strength	Kg/cm ²	ASTM	D638	520	
Elongation	%	ASTM	D638	> 200	
Flexural Strength	Kg/cm ²	ASTM	D790	770	
Flexural Modulus	Kg/cm ²	ASTM	D790	22900	
Rockwell Hardness	R	ASTM	D785	118	
Thermal properties					
Heat Deflection Temperature		ASTM	D648		
	66psi	°C		-	
	264psi	°C		56	
Flammability	-		UL94	HB	
Melting Point		°C	DSC	223	
Melt Index	250°C/2.16Kg	g/10min	ASTM	D1238	12
Electrical properties					
Dielectric Strength	KV/MM	ASTM	D149	15	
Dielectric Constant	...	ASTM	D150	3	
Volume Resistivity	Ω-CM	ASTM	D257	1.00E+16	
Other properties					
Specific Gravity	-	ASTM	D792	1.30	
Water Absorption	%	ASTM	D570	0.08	
Mold Shrinkage		ASTM	D955		
	Flow	%		0.8~2.0	
	Cross Flow	%		0.8~2.0	
Acid Value	μ equ/g		Zimmer PV07013.4	9	
Color			JIS Z 8722		
	L Value			89.6	
	a Value			-0.6	
	b Value			3.4	

Properties at low temperature

Table 2. Properties of SHINITE® PBT loose cable standard grade – DK5006, at low temperature

PROPERTIES		Unit	Test Method	Values
IZOD IMPACT NOTCHED	(23°C)	kg-cm/cm	ASTM D256	7
	(-40°C)	kg-cm/cm	ASTM D256	4.9
	(-50°C)	kg-cm/cm	ASTM D256	4.9
TENSILE STRENGTH	(23°C)	kg/cm ²	ASTM D638	545
	(-50°C)	kg/cm ²	ASTM D638	858
	-50°C -> 23°C	kg/cm ²	ASTM D638	560
ELONGATION	(23°C)	%	ASTM D638	> 100
	(-50°C)	%	ASTM D638	11
	-50°C -> 23°C	%	ASTM D638	> 100

Color

Here following color masterbatch dosage rate, tensile strength, weight, and color stability after aging.

Table 3. Recommended color masterbatch dosage rate for SHINITE® PBT loose tube grade

Color	Spec	Bulk Density	Dosage Rate
Black	PCFPB3 A T0207	0.76	4%
Blue	PCFPU3 A T5014	0.8	4%
Red	PCFPR3 A T3008	0.78	4%
Green	PCFPG3 A T6018	0.79	4%
Yellow	PCFPY3 A T1003	0.77	4%
Purple	PCFPV3 A T4002	0.74	4%
White	PCFPW3 A T0015	0.85	4%
Brown	PCFPC3 A T7015	0.81	4%

Table 4. Test result of “Soak in petroleum jelly at 70°C, after 14 days”

Color	Tensile str.	Tensile str.(Aging)	%	Weight	Weight (Aging)	%
NA	587	593	1.0%	5.8389	5.8395	0.01%
WH	593	602	1.5%	5.8995	5.9036	0.07%
YL	607	610	0.5%	5.8579	5.8595	0.03%
RD	623	653	4.8%	5.8472	5.8492	0.03%
GN	616	608	-1.3%	5.8652	5.8670	0.03%
BL	613	620	1.1%	5.8162	5.8239	0.13%
BR	595	616	3.5%	5.8307	5.8326	0.03%
VI	597	590	-1.2%	5.8452	5.8471	0.03%
BK	603	593	-1.7%	5.8307	5.8329	0.04%

Table 5. Test result of “Soak in petroleum jelly at 90°C, after 30 days”

Color	$\Delta E(\text{Aging}) - \Delta E$
NA	4.47
WH	4.18
YL	5.11
RD	1.50
GN	2.29
BL	1.11
BR	2.32
VI	1.74
BK	3.07

Chemical Resistance Test

One reason why we strongly believe SHINITE® PBT loose tube grade is best for your optical fiber loose tube feedstock is based on its superior performance on chemical resistance.

Table 6. Chemical Resistance Ability in different chemicals

Chemical Method	°C	Days	%Retention of strength	Chemical Method	°C	Days	%Retention of strength
Acids				Alkali			
10% hydrochloric	23	30	96	5% Potassium Hydroxide	23	30	96
	23	90	93		23	90	93
10% Sulfuric	23	180	88	10% Sodium Hydroxide	23	30	93
	23	30	97		23	180	91
	23	90	94	10% Ammonium Hydroxide	23	30	87
36% Sulfuric(battery)	23	180	90		23	90	70
	23	30	99		23	180	60
	23	180	99	Automotive Related Environment			
	66	30	92	Ethyl Glycol(Plastron Antifreeze)	23	30	100
	66	180	92		23	180	100
10% Acetic Acid	23	30	91	Motor oil(Shell Super X)	23	30	100
	23	180	89		23	180	100
Organic Solvent					121	30	92
Ethyl Alcohol	23	30	98		121	180	29
	23	180	94	Transmission fluid(Dexron)	23	30	100
Methyl Alcohol	23	30	76		23	180	100
	23	180	64		121	30	100
Isopropyl Alcohol	23	30	100		121	180	51
	23	180	100	Power steering fluid(Delco)	23	30	100
Isopropyl Alcohol&Water (50:50)		30	100		23	180	100
	23	180	99		66	30	100
1,4Butanediol	23	30	100		66	180	99
	23	180	97	Brake fluid(Delco supreme No.1)	23	30	100
Toluene	23	30	87		23	180	100
	23	180	73		66	30	87
Heptane		30	100		66	180	73
	23	180	100	Gasoline(Shell regular)	23	30	100
Turpentine	23	30	99		23	180	100
	23	180	94		60	30	90
Acetone	23	30	70	Gasoline(Shell premium)	23	30	100
	23	180	48		23	180	100
Methyl Ethyl ketone	23	30	73		60	30	88
	23	180	54	Gasoline(Shell unlead)	23	30	95
Ethyl Acetate	23	30	77		23	90	95
	23	180	62		60	30	87
Methylene Chloride	23	30	33				
	23	180	32				