



WANHUA CHEMICAL
GROUP CO., LTD.

万华化学集团股份有限公司

Wanamid®
Special nylon 12 series products



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Innovation Creates Excellence 创新成就卓越



Wanhua

To become an innovative, world-class chemical company,
admired by our employees and respected by the community.

www.whchem.com

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Innovation Creates Excellence



INTRODUCTION OF WANHUA CHEMICAL GROUP

ABOUT US



Established in 1998 & listed on the Shanghai Stock Exchange in 2001 (Stock No. 600309).



Dedicated to R&D, production and sales of PU related products, petrochemicals, fine chemicals.



Headquartered in Yantai, Shandong Province; 3 integrated manufacturing sites in Yantai, Ningbo, Sichuan, Fujian and Hungary; 10+subsidiaries and offices in America, Europe, Japan and India, etc. 15000+ employees.

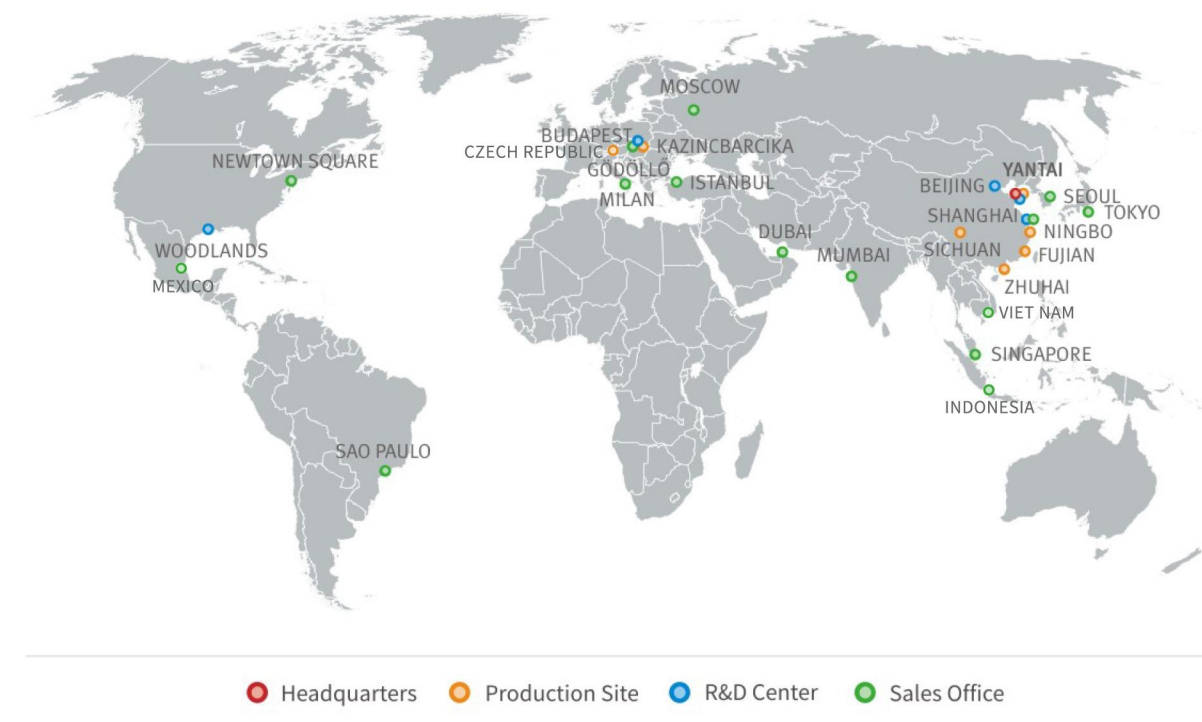


Focusing on customers'needs and innovation; implementing integrated, diversified and refined development strategy in high - tech and high value-added chemicals & materials; committed to grow into world - class chemical company with global operation.

BUSINESS SCOPE

Polyurethane				
• Isocyanate		• Polyether polyol		
Petrochemicals				
• Ethylene	• HDPE	• NPG	• MMA	• BD
• EO	• PVC	• AA	• PO	• MTBE
• MEG	• Propane	• GAA	• PP	• TBA
• SM	• Propylene	• MA	• Butane	• IB
• LLDPE	• NBL	• BA	• IBT	• DIBE
Performance Chemicals				
• Silicone	• Water-based Resins	• EOD	• Specialty Amines	
• Rubbers & Plastics	• Home & Personal Care	• Membrane Material		
Emerging Materials				
• Battery Materials	• Electronic Materials	• 3D Printing Materials		

Global Network



AWARDS & HONORS

2007

The first prize of National Science and Technology Progress

2008

National Environment-friendly Project

2010

The second prize of National Science and Technology Progress

2011

China Grand Awards for Industry-Recognition Award

2012

Top 100 Innovative Companies in China

2015

Shandong Governor Quality Award

2009-2017

Five consecutive sessions Award for Hewitt Best Employers in China

2018

C&EN-Global Top 50

2019

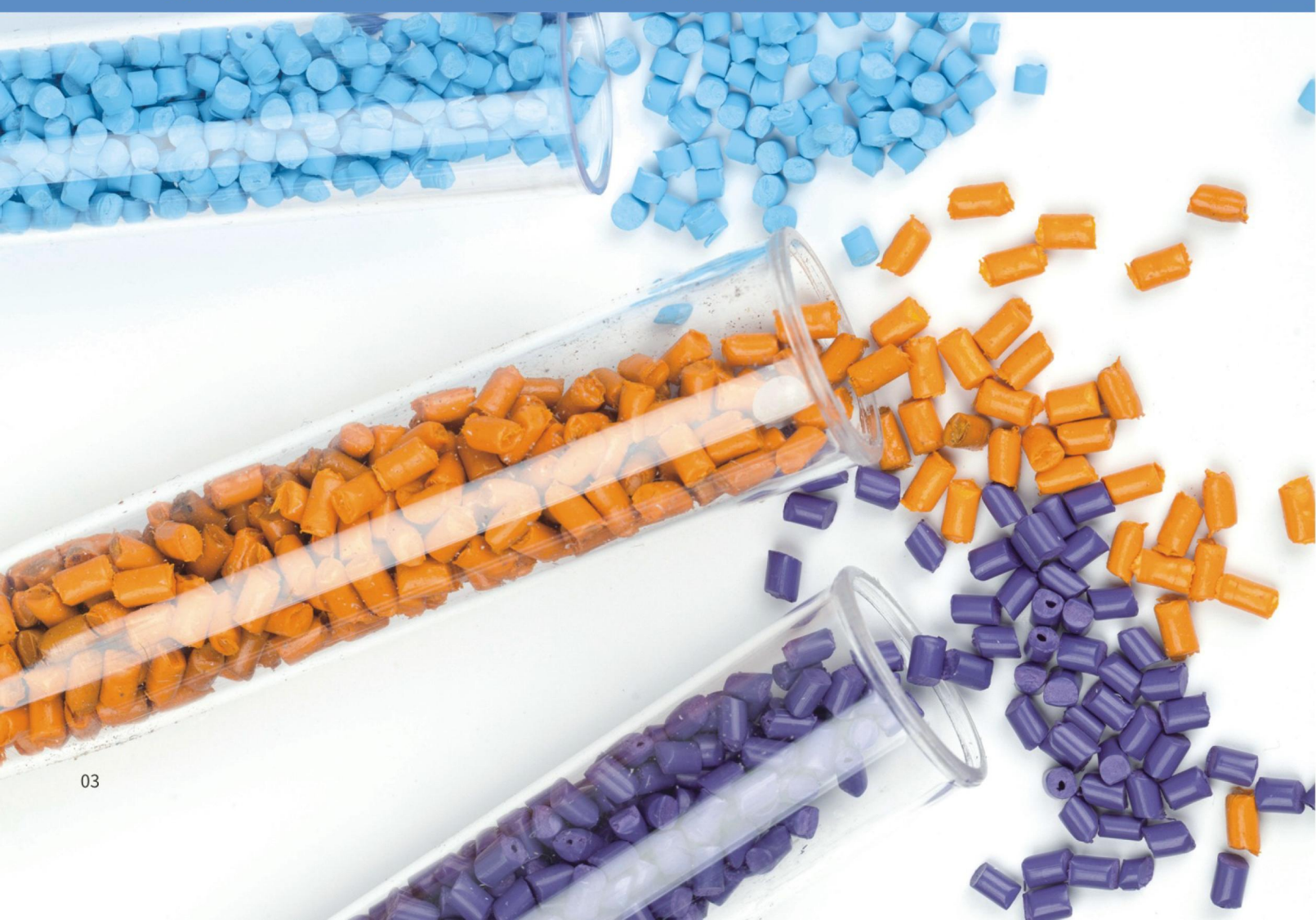
The first Chinese company to join the Together for Sustainability (Tfs) Initiative in 2019
Won PPG's Excellent Supplier Award in 2016 and 2019

2020

Consolidation of Wanhua Chemical (Fujian) Co., Ltd.
The ethylene cracking unit was successfully started up at once, thus all the key units in ethylene industry chain were successfully commissioned
The Wanhua Sichuan site phase i modified plastics project was successfully delivered



WANHUA CHEMICAL'S MODIFIED PA12 PRODUCT



Introduction

PA12 is a long carbon chain nylon synthesized by laurolactam. PA12 has the lowest water absorption rate in nylon compared to conventional nylons such as PA6 and PA66 due to its lower amide bond concentration, and the size change after water absorption is significantly lower than other nylons.

Wanhua Chemical is the company that owns the entire PA12 synthesis industry chain. Wanhua Chemical has developed modified PA12 products that are suitable for extrusion, injection molding, film blowing, and other processing technologies, and have been applied to many fields such as automotive, E&E, communication, medical treatment, and sports equipment.

PA12 has the following characteristics:

- The lowest density in nylon products, which is conducive to lightweight materials;
- Water absorption is the lowest in conventional, the size is almost not affected by humidity;
- Wide processing temperature range and good processing ability, suitable for extrusion, injection molding, film blowing and other processing methods;
- Excellent resistance to organic solvents, gasoline, fuel and salt solutions;
- Low friction coefficient and excellent wear resistance;
- Good low temperature toughness;
- Excellent stress cracking resistance

Resistance to chemical solvent

Because PA12 is resistant to most organic solvents and alkalis and is almost unaffected by gasoline and other fuels, it is widely used in automotive fuel lines. A high concentration of strong acid can destroy the amide bond in the PA12 molecular chain, causing the chain to break and degrade. As a result, PA12 is sensitive to high concentrations of strong acid, but it can tolerate most dilute inorganic and organic acids.

What needs to be considered when plasticizing products is that the plasticizer can be extracted by solvent; if the PA12 is not dry, the solvent will replace the position of the plasticizer in PA12, and the product performance will essentially remain unchanged; if the PA12 is dry, the solvent will be removed, and the product performance will decline, so the effect of solvent on the plasticizer must be considered.

Heat Resistance

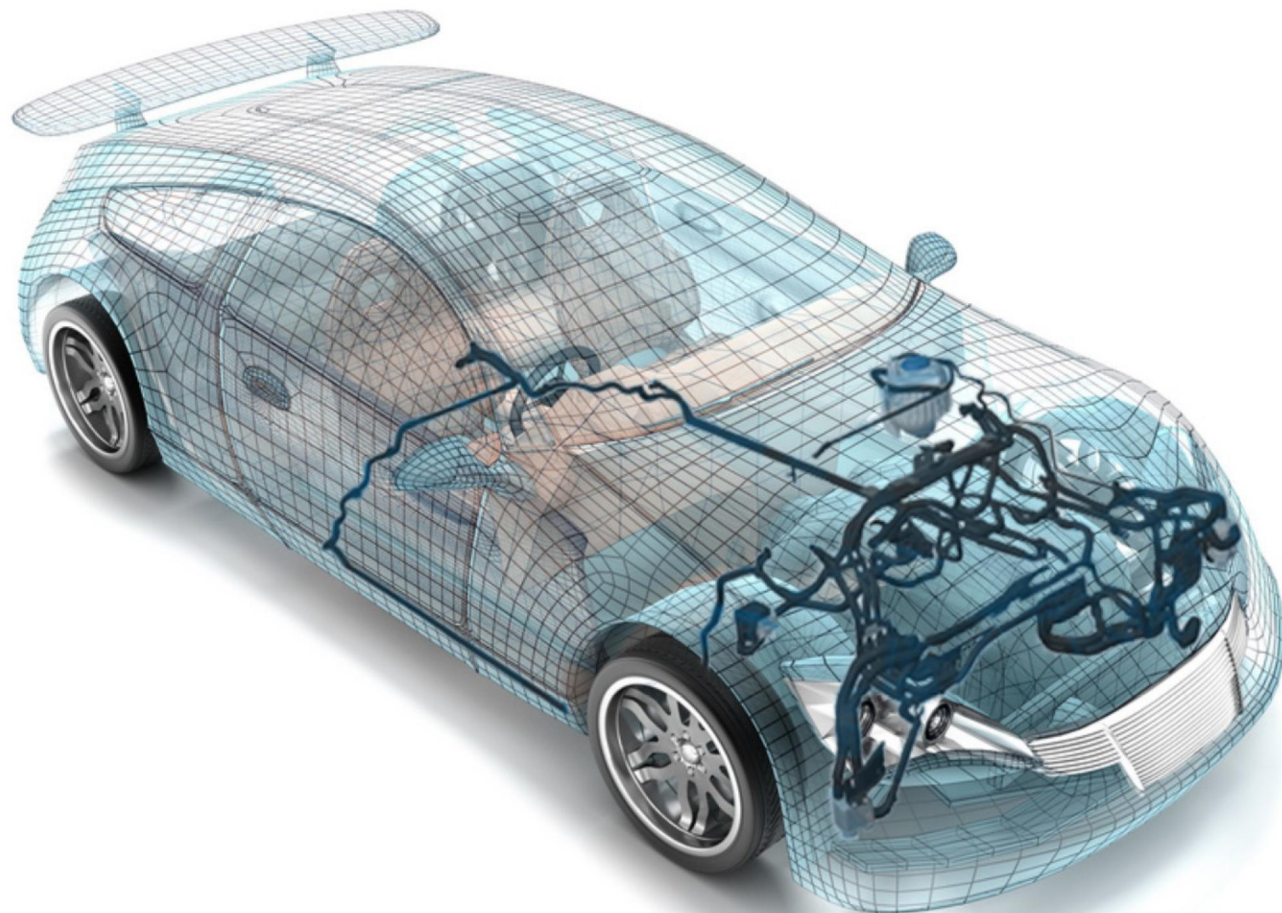
Polymers, including polyamide, will age at high temperatures. Chemical reactions such as oxidation reaction and molecular chain break will occur during the aging process, as will physical changes such as molecular chain rearrangement and crystallization perfection, both of which are detrimental to the stability of polymer properties. With the exception of a few special products, the majority of Wanamid products have excellent heat resistance. Wanhua can provide products with enhanced heat aging resistance for high-temperature applications such as the periphery of automobile engines.

UV resistance

For outdoor products, the effect of UV on the performance of polymer products must be considered. UV can lead to the accelerated fracture of the molecular chain of polyamide, resulting in the deterioration of product performance. Especially in outdoor environment, the effect of UV combined with temperature, humidity, oxygen and other factors will be more significant. For outdoor products, Wanhua chemical recommends to make the products black, carbon black can maximize the protection of products from the effects of ultraviolet light, if the color of products is limited, Wanhua Chemical can also provide the addition of light stabilizer and UV stabilizer products, in order to achieve good UV resistance.

Resistance to hydrolysis

Although polyamide, as a polycondensation product, has a natural disadvantage in hydrolysis resistance, PA12 has a lower amide bond concentration than the common polyamides PA6 and PA66, so PA12 has a better hydrolysis resistance. The hydrolysis and alcoholysis resistance of PA12 can be greatly improved by modification technology, which is suitable for automobile cooling pipe, urea pipe, thermostatic faucet and other applications.



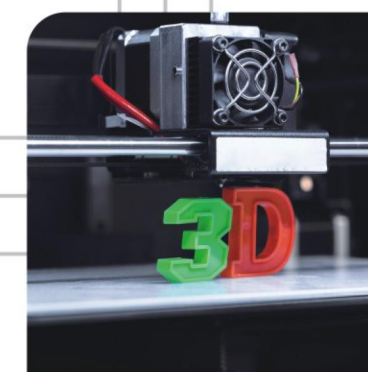
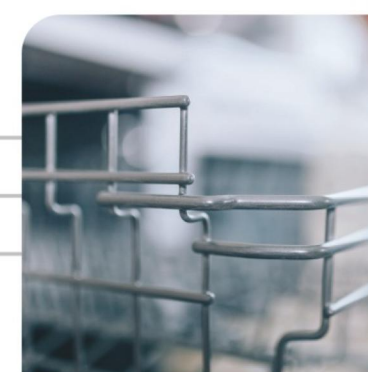
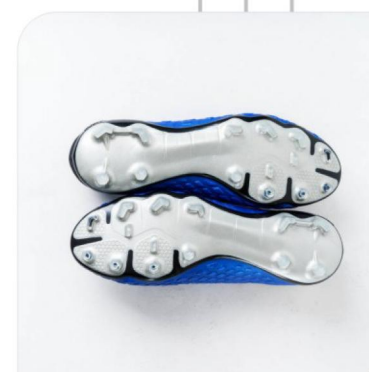
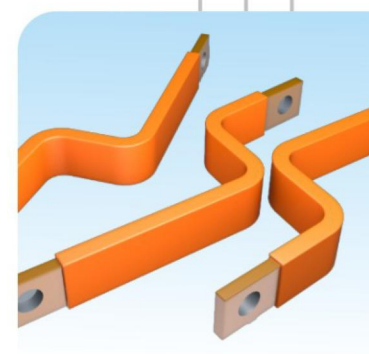
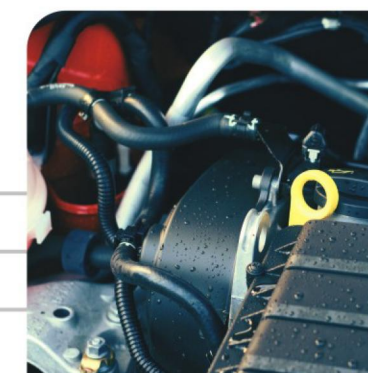
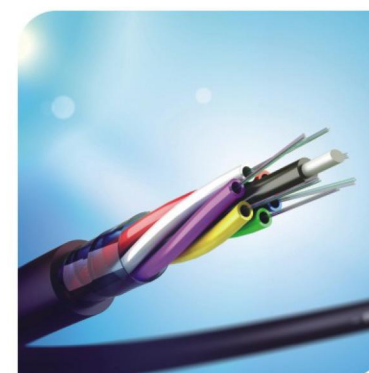
WANHUA CHEMICAL' S MODIFIED PA12 PRODUCTS

Wanhua provides various customized modified PA12 materials, mainly divided into flexible, reinforced, flame retardant, functional modified PA12 and PA12 powder, to meet the needs of different fields such as automobile, electronics, electric appliance, communication, medical and sports equipment. The specific material properties are shown in the table below.

Wanamid®

The product series includes

- Flexible PA12
- Enhanced PA12
- Powder PA12
- Flame retardant PA12
- Functionalized PA12
- 3D printing PA12





WANHUA CHEMICAL'S MODIFIED PA12 PRODUCTS

Wanhua provides various customized modified PA12 materials, mainly divided into flexible, reinforced, flame retardant, functional modified PA12 and PA12 powder, to meet the needs of different fields such as automobile, electronics, electric appliance, communication, medical and sports equipment.

Commercial vehicle



SCR pipe
L2040P, L3001, L2102E

Automotive air brake tubes product
L2040P, L2050P Y

Automotive fuel line products
L2040P, L2050P

Automotive Quick Connector product
L2100G, L2300G, L2150C

Rail transit

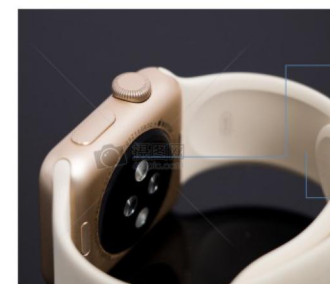


Headlight housing
L2351M N

Cable sheath
L3001

Antenna
L2351M N

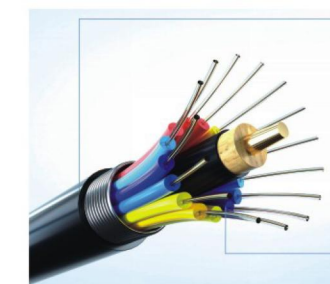
Intelligent Wear



Smart watch bottom case
L2500G, L2650G, L2350G N

Strap buckle
L2500G, L2400G

Cable Protective Cover



Cable sheath
L3001, L2040P, L2001

Optical cable sheath
L1001

Passenger Vehicle



Spray-free High-gloss Automotive Interior and Exterior Materials
L2100T

Automotive Quick Connector product
L2300G, L2150C

Tank 2K valve
L2300G R

Cable bundling sleeve
L3001

New energy automobile



EV Busbar product
L2001 T, L2100N

Pipes of the thermal management system
L2101E, L2102E, L2040P

Powder coating



Dishwasher basket
Fluidized bed coating
PA12 powder

Dishwasher water pump
L2300G, L2500B

Industrial equipment

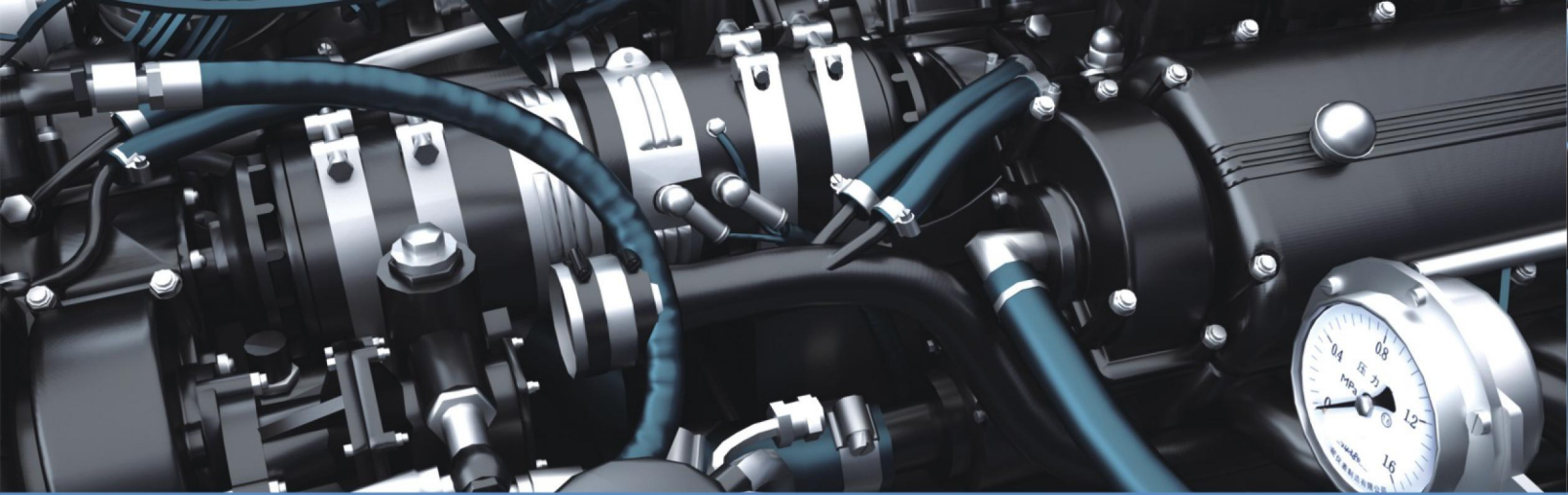


Lubricating pipe
L2130, L2040P

Hydraulic pipe
L2040P

Pneumatic hoses
L2040P

Power supply closing shaft
L2400L N, L2400L F



WANAMID® FLEXIBLE PA12 SERIES

Product application

Pipe Series, Cables and Cords, Industrial piping, Oil and gas pipeline etc.

Typical index

Product type				Flexible PA12										
Grade				L2030P	L2040P	L2050P	L2050P Y	L2102E	L2101E	L2001	LOG3130	L2040P T	L2100 T	L3130
Product description				High viscosity, Light Resistant, Heat-proof aging, Excellent low temperature performance	High viscosity, Light Resistant, Heat-proof aging, Excellent low temperature performance	High viscosity, Light Resistant, Heat-proof aging, Excellent low temperature performance	High viscosity, Light Resistant, Heat-proof aging, High burst compressive strength	High viscosity, Light Resistant, Heat-proof aging, Hydrolysis resistance, Excellent low temperature performance	High viscosity, Light Resistant, Heat-proof aging, Hydrolysis resistance, Excellent low temperature performance	Medium viscosity, Light Resistant, Heat-proof aging, Low temperature resistant	High viscosity, Light Resistant, Heat-proof aging, Excellent permeability resistance	High viscosity, Light Resistant, Heat-proof aging, Hydrolysis resistance	Medium viscosity, Light Resistant, Heat-proof aging, Excellent wear resistance	Medium viscosity, Light Resistant, Heat-proof aging, High burst compressive strength
Product application				Automotive air brake pipe, Brake screw line, wire	Automotive air brake pipe, Automotive fuel line products, Vacuum tube	Automotive fuel line products, Hydraulic pipe, Cable Protective Cover, Vacuum tube	Automotive air brake pipe, Hydraulic pipe	Automobile cooling pipe, Urea pipe	Automobile cooling pipe, Water pipe	Termite-resistant cable, Functional cable, Pipe fitting	Oil and natural gas pipeline, Municipal gas pipeline	Anticorrosive extruded coated metal pipe, Leak-proof pipe	Wire feed tube, Brake cables, Bearing end cap, Axle sleeve	Wind power lubricating oil pipe
Product performance	Testing method	The test conditions	Unit											
Fundamental properties														
Density	ISO 1183	—	g/cm ³	1.03	1.02	1.01	1.01	0.98	0.98	1.00	1.01	1.02	1.09	1.02
Equilibrium water absorption	ISO 62	23°C, 50%	%	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.3	0.4
Mechanical property														
Tensile yield stress	ISO 527	50mm/min	MPa	23	27	32	31	28	31	41	38	25	48	43
Nominal strain at tensile fracture	ISO527	50mm/min	%	>150	>150	>150	>150	>150	>150	>150	>150	>150	>20	>150
Tensile modules of elasticity	ISO 527	1mm/min	MPa	370	400	520	550	1010	1150	1250	1250	400	2300	1400
Notched impact strength of simply supported beams	ISO 179	23°C	kJ/m ²	130	130	105	100	90	75	15	40	125	5	6
	ISO 179	-30°C	kJ/m ²	7	7	6	7	60	20	6	18	6	3	5
Thermal property														
Melt point	ISO11357	—	°C	171	172	174	174	177	177	177	177	172	177	178
HDT	ISO75	0.45MPa	°C	85	100	105	110	80	85	115	105	95	115	120



WANAMID® GLASS FIBER REINFORCED PA12 SERIES

Product application

Electronics & Electrical, Sports equipment, Automotive Quick Connector product, Connector, Bathroom, Outer shell, Support, etc.

Typical index

Product type				Glass fiber reinforced PA12			Glass fiber reinforced PA12			
Grade				L2150G	L2230G	L2300G	L2400G	L2500G	L2650G	L2600L
Product description				15% glass fiber filled	23% glass fiber filled	30% glass fiber filled	40% glass fiber filled	50% glass fiber filled	65% glass fiber filled	60% glass fiber filled
Product application				Buckle, Quick Connector	Buckle, Quick Connector	Quick Connector product, Bracket, Enclosure	Quick Connector product, Bracket, Enclosure	Electronics & Electrical, Bathroom	Electronics & Electrical, Bathroom	Electronics & Electrical, Support
Product performance		Testing method	The test conditions	Unit						
Fundamental properties										
Density	ISO 1183	—	g/cm ³	1.11	1.18	1.23	1.34	1.46	1.64	1.57
Equilibrium water absorption	ISO 62	23°C, 50%	%	0.7	0.6	0.5	0.5	0.4	0.4	0.4
Mechanical property										
Nominal strain at tensile fracture	ISO 527	50mm/min	MPa	90	105	120	130	150	160	170
Tensile modules of elasticity	ISO 527	1mm/min	MPa	3800	5500	6800	8500	13500	18500	18000
Notched impact strength of simply supported beams	ISO 179	23°C	kJ/m ²	18	23	25	25	26	20	44
	ISO 179	-30°C	kJ/m ²	12	14	16	18	21	15	38
Thermal property										
Melt point	ISO11357	—	°C	178	178	178	178	178	178	178
HDT	ISO75	1.8MPa	°C	160	160	165	165	165	165	168
Electrical properties										
CTI	IEC 60112	—	—	600	600	600	600	600	600	600
Volume resistivity	IEC 60093	—	Ω*cm	10 ¹⁴	10 ¹⁴	10 ¹⁴	10 ¹⁴	10 ¹⁴	10 ¹⁴	10 ¹⁴



WANAMID®CARBON FIBER REINFORCED PA12 SERIES

Product application

Electronics & Electrical, Sports equipment, Automotive Quick Connector product, Connector, Bathroom, Outer shell, Support, etc.

Typical index

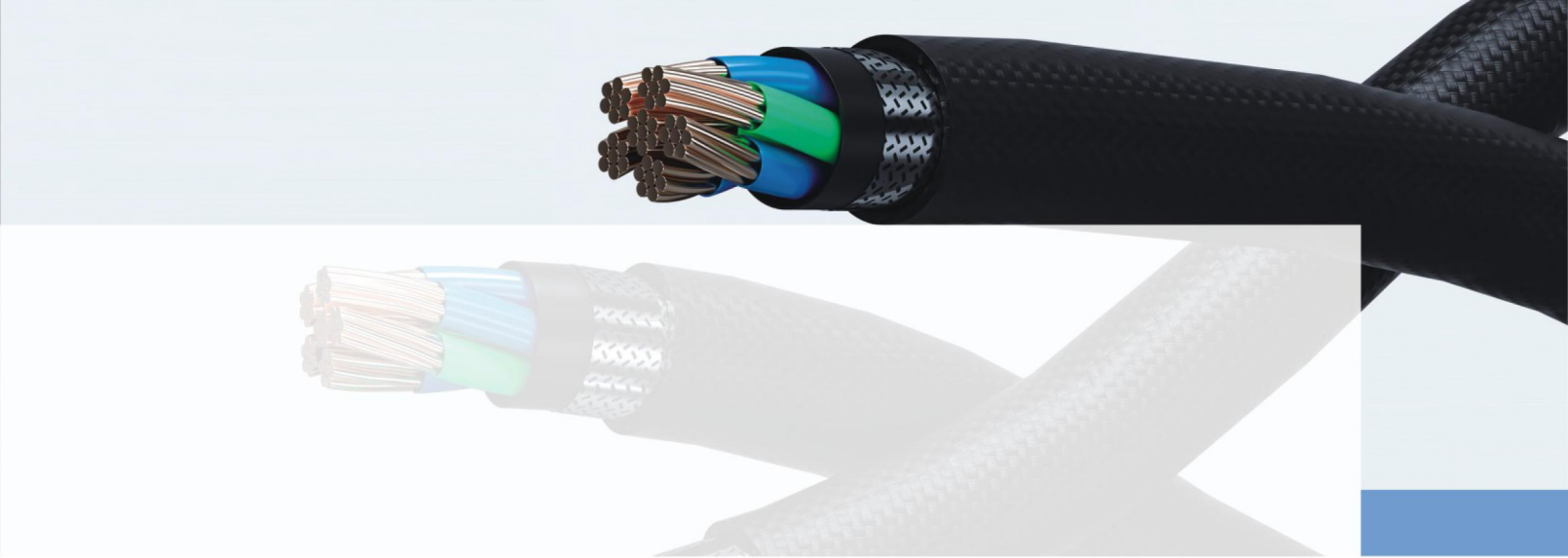
Product type				Carbon fiber reinforced PA12				
Grade				L2100C	L2150C	L2200C I	L2300C	L2400C
Product description				10% carbon fiber, High specific strength, Fine size stability	15% carbon fiber, High strength, High modulus, Fine size stability, Conductivity	20% carbon fiber, High strength, High modulus, Excellent impact performance	30% carbon fiber, High s trength, High modulus, Fine size stability, Conductivity	40% carbon fiber, High strength, Super-drawn modulus
Product application				Lightweight equipment	Sports equipment, Pipe Series, Conductive quick connector product	Sports equipment, Ski Helmets	Sports equipment, Unmanned aerial vehicles, Pipe Series, Conductive quick connector product	Sports equipment, Unmanned aerial vehicles, Electronic component
Product performance	Testing method	The test conditions	Unit					
Fundamental properties								
Density	ISO 1183	—	g/cm ³	1.06	1.12	1.12	1.15	1.22
Equilibrium water absorption	ISO 62	23°C, 50%	%	0.7	0.7	0.6	0.5	0.6
Mechanical property								
Nominal strain at tensile fracture	ISO 527	50mm/min	MPa	115	116	100	150	170
Tensile modules of elasticity	ISO 527	1mm/min	MPa	7000	8400	8500	15000	23000
Notched impact strength of simply supported beams	ISO 179	23°C	kJ/m ²	20	16	31	20	13
	ISO 179	-30°C	kJ/m ²	10	8	20	14	11
Thermal property								
Melt point	ISO11357	—	°C	178	178	178	178	178
HDT	ISO75	1.8MPa	°C	165	170	170	170	170
Electrical properties								
Volume resistivity	IEC 60093	—	Ω*cm	10 ⁸	10 ⁵	10 ⁷	10 ³	10 ³



WANAMID® FLAME RETARDANT PA12 SERIES

Product application

Busbar, Cables and Cords, Fireproof pipe etc.



Typical index

Product type				Flame retardant PA12		
Grade				L2001 T	L3001 N	L3040P N
Product description				Excellent adhesion with metal, Color stability	Halogen-free and phosphorus-free flame retardant	Halogen-free and phosphorus-free flame retardant, Excellent impact strength
Product application				Busbar of new energy vehicles	Harness sleeve	Corrugated pipe of high-speed railway, High voltage harness etc.
Product performance	Testing method	The test conditions	Unit			
Fundamental properties						
Density	ISO 1183	—	g/cm ³	1.01	1.04	1.06
Equilibrium water absorption	ISO 62	23°C, 50%	%	0.7	0.6	0.6
Mechanical property						
Tensile yield stress	ISO 527	50mm/min	MPa	41	36	34
Tensile yield modulus	ISO 527	1mm/min	MPa	1350	1400	450
Nominal strain at tensile fracture	ISO 527	50mm/min	%	>150	>150	>150
Notched impact strength of simply supported beams	ISO 179	23°C	kJ/m ²	13	9	110
	ISO 179	-30°C	kJ/m ²	7	6	5
Thermal property						
Melt point	ISO11357	—	°C	178	178	172
HDT	1.8MPa	—	°C	42	45	43
Flame retardant properties						
Flame Rating	UL94	0.8mm	—	HB	V2	V2
	UL94	1.6mm	—	HB	V2	V2
Electrical properties						
CTI	IEC 60112	—	—	600	600	600

WANAMID® ENHANCED FLAME RETARDANT PA12 SERIES

Product application

Automotive Quick Connector product, Electronics & Electrical, High-speed railway structural parts, Subway lamp bracket etc.

Typical index

Product type				Halogen-containing flame retardants		Halogen-free flame retardant					
Grade				L2400L F		L2350G N		L2351G N		L2351M N	
Product description				GF40, High impact strength, Low warpage		V0 flame retardant		Conforming to the flame retardant requirements of rail transit in EN45545-2, Excellent high and low temperature impact strength		Conforming to the flame retardant requirements of rail transit in EN45545-2, Low warpage, Resistance to environmental stress cracking	
Product application				Electronics & Electrical		PV connector		High-speed rail radome, High voltage connector etc.		Subway lamp shell and other structural parts	
Product performance	Testing method	The test conditions	Unit								
Fundamental properties											
Density	ISO 1183	—	g/cm ³	1.53		1.40		1.32		1.35	
Equilibrium water absorption	ISO 62	23°C, 50%	%	0.5		0.5		0.5		0.5	
Mechanical property											
Tensile strength	ISO 527	50mm/min	MPa	136		115		100		40	
Tensile modulus	ISO 527	1mm/min	MPa	11500		10500		6500		4100	
Notched impact strength of simply supported beams	ISO 179	23°C	kJ/m ²	28		14		32		9	
	ISO 179	-30°C	kJ/m ²	23		11		18		6	
Thermal property											
Melt point	ISO11357	—	°C	178		178		178		178	
HDT	ISO75	1.8MPa	°C	170		165		160		160	
Flame retardant properties											
Flame Rating	UL94	1.6mm	—	V0		V0,5VA		—		—	
	UL94	3.0mm	—	V0		V0,5VA		—		—	
	LOI	—	%	—		—		33		34	
Electrical properties											
CTI	IEC 60112	—	—	600		600		600		600	

Note: The data in the table are typical values



WANAMID® FUNCTIONALIZED PA12 SERIES

The product application

Smart apparel (VR glasses, smart bracelet, etc.), conductive tubing, electronic appliances shell, automobile interior trim, etc.

Typical indicators

The product type				Low density PA12		Free spraying PA12		Electromagnetic shielding PA12	Laser welding PA12
The product brand				L2400H	L2300H I	L2100T	L3001 sca009	L2200M E	L2300G X
The product description				Low density, low dielectric, Low curl	Low density, high impact, Low curl	High gloss, Free spraying	High gloss, Piano black	Excellent electromagnetic shielding performance , High strength	Suitable for laser welding
The product application				Smart apparel etc	Smart apparel etc	Home appliance shell, electronic equipment shell	The car interior	Electromagnetic shielding cavity, millimeter wave radar shell, communication connectors, etc	Joints and pipe welding
Product performance	The test method	The test conditions	Unit						
Basic Physical properties									
Density	ISO 1183	—	g/cm ³	0.82	0.88	1.08	1.01	1.24	1.23
Equilibrium moisture content	ISO 62	23°C, 50%	%	0.4	0.4	0.5	0.7	0.5	0.5
Mechanical properties									
Tensile breaking stress	ISO 527	50mm/min	MPa	50	66	51	50	55	115
Tensile modules of elasticity	ISO 527	1mm/min	MPa	2500	3000	2300	1300	2700	7000
Charpy Notched Impact Strength	ISO 179	23°C	kJ/m ²	4	6	5	13	9	24
	ISO 179	-30°C	kJ/m ²	3	5	4	7	5	15
Thermal property									
Melting point	ISO11357	—	°C	178	178	178	178	178	178
HDT	ISO75	0.45MPa	°C	155	160	150	125	120	165
Electrical properties									
Volume resistivity	IEC 60093	—	Ω*cm	10 ¹⁵	10 ¹⁵	10 ¹⁵	10 ¹⁵	10 ⁴	10 ¹⁴



WANAMID® POWDER PA12 SERIES

Product application

powder coatings, 3D printing, additive

Typical indicators

The product description				Powder coating		3D printing	
				Fluidized bed impregnation	Electrostatic spraying	500W	600GF
				Large particle size PA12 powder	Small particle size PA12 powder	PA12 powder	PA12 + glass fiber
Processing conditions				290-400°C, pre-processing	200-250°C	laser sintering	laser sintering
The product application				Bowl tub, flower leg shaft, gear, spring and slide rail, etc	anticorrosive coating	—	—
Product performance	The test method	The test conditions	Unit				
Basic Physical properties							
Density	ISO 1183	—	MPa	1.016	1.016	1.016	1.250
Packing density	ISO 9136	—	g/L	470	390	490	620
Powder particle size	内部方法 (D50)	—	um	90-120	80-120	70-90	70-90
Mechanical properties							
Tensile strength	ISO 527	50mm/min	MPa	49	49	49	58
Elongation at break things	ISO 527	50mm/min	%	6	6	6	5
Corrosion resistant	内部方法	35°C, 1000h 5%Salt mist	Grade of adhesion	3级	3级	3级	3级
	EN10310	23±3°C 30day, desalted water	Grade of adhesion	3级	3级	3级	3级
Thermal property							
Melting point	ISO11357	—	°C	178	178	178	178

Note: The data in the table are typical values



TREATMENT METHOD AND PROCESSING TECHNOLOGY

Treatment method

Storage

Unopened materials can be stored for a long time in a cool and dry environment away from direct sunlight. After being opened, it is recommended to use the materials as soon as possible to avoid the effects of moisture or impurities during storage.

Drying

Wanhua modified PA12 adopts multi-layer aluminum plastic bag with breathing valve, in the case of the package remains intact, not opened and damaged, there is no need for further drying. If the material has been opened before use, it is recommended to use a blast drying oven at 100°C for 4h or a dehumidifier for 2-3h to reduce the moisture content in the polymer to less than 0.1%. If the drying temperature or time is insufficient, the polymer contains too much moisture, which may lead to problems in the processing or product performance deterioration. If the drying temperature is too high or the time is too long, it may lead to discoloration and performance deterioration of the polymer. For plasticized products, proper drying temperature and time is more important as the plasticizer may be removed during the drying process. In addition, if the material needs to stay in the hopper for a long time during the processing, the hopper heating system is recommended.

Processing technology

Injection Molding

For non-reinforced PA12 products, Wanhua recommends the injection temperature of 220-260 °C, while for reinforced PA12 products, Wanhua recommends the injection temperature of 240-280 °C. For some special brands with low fluidity or molds that are difficult to fill, the injection temperature can be increased to 300 °C, but higher temperature is not recommended to avoid oxidation discoloration or performance degradation of PA12 in the barrel. In such cases, increasing mold temperature is often a more effective and performance-beneficial method. The specific injection temperature can refer to the corresponding chemical technical data sheet of each brand product.

Extrusion Molding

The extrusion molding of PA12 is mainly used to process 3D printing wires and various pipelines such as automobile fuel pipe, cooling pipe, air brake pipe, extrusion coated metal pipe, etc. The common extruder suitable for polyamide extrusion can be used as the processing equipment. The specific extrusion temperature can be adjusted according to the melt state at the die. If the temperature is too high, the melt strength is low, and it is easy to appear melting sag, the pipe is not easy to set, and if the temperature is too low, the material is not easy to be extruded. In addition, the moisture content of the material has a significant impact on pipeline extrusion. When there is too much moisture in the material, a large number of bubbles are often formed in the extrusion process. These bubbles are easy to break during pipeline vacuum sizing, resulting in extrusion failure. For the extrusion of 3D printing wire rod, it should be noted that the cooling water temperature is recommended to be above 40 °C to prevent the wire rod from cooling too fast and shrinkage holes inside.



VALUE-ADDED SERVICES

Wanhua chemical provides customers with professional customized material solutions, and provides comprehensive technical services and support

Wanhua Chemical has a number of CNAS certified test laboratories in Yantai and Ningbo, with a variety of test capabilities in mechanics, optics, thermology, structural analysis, etc., to ensure that Wanhua Chemical provides better services to customers.

Wanhua chemical has a technical service team with rich experience in material processing, which can provide customers with services such as mold design, processing, molding problem solving.

Processing and technology

Provide customers with modified PA12 products with stable performance by controlling processing and process.

CAE

Wanhua Chemical can provide injection mold flow analysis and injection molding process support, and provide part mechanical analysis support.

CAE VALUE-ADDED SERVICES

CAE data support

Structural analysis data support

- Static data
- Creep data
- dynamic data
- Linear expansion coefficient

Model flow analysis data support

- UDB file

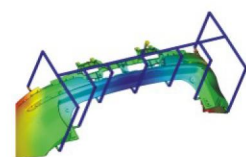
CAE analysis support

Structural analysis support

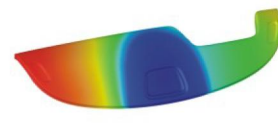
- Static analysis
- Creep Analysis
- Impact/collision analysis
- Thermal deformation analysis

Model flow analysis support

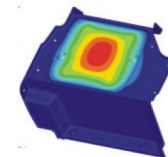
- Flow filling analysis
- Warpage deformation analysis



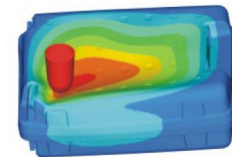
Model flow analysis of bumper



PU foaming analysis of foaming layer of instrument panel



Stiffness analysis of battery cover plate



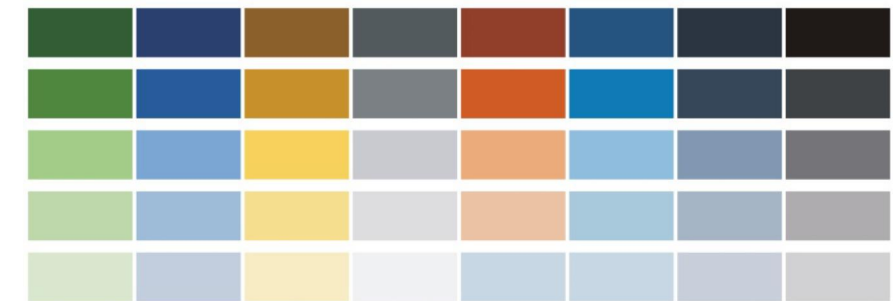
Analysis of the impact of falling ball on luggage



CMF

COLOR DEVELOPMENT

- Investigation and analysis of color trend
- Color development and matching scheme
- Accurate color matching



RESEARCH ON MATERIAL VISION

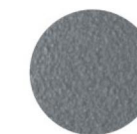
- Material properties
- Material touch and vision
- Material processing and forming capacity



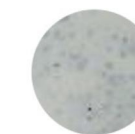
Marble effect



Fluff effect



Metal effect



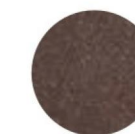
Multi-color mottling effect

SURFACE TREATMENT

- Surface texture
- Mold surface treatment
- Natural effect brought by filler



Texture effect



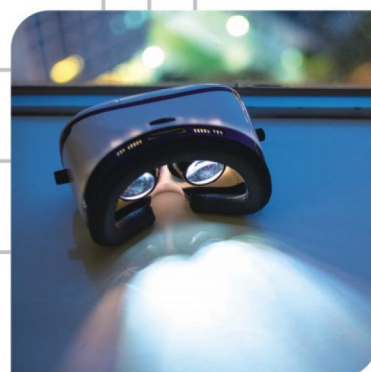
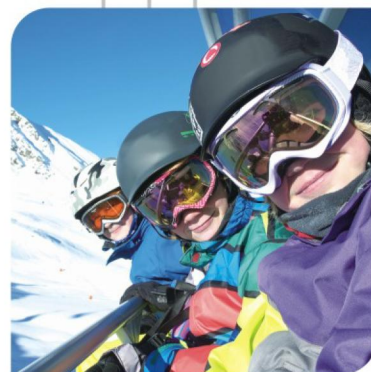
Plant fiber effect



Chameleon effect



Matte finish



DISCLAIMERS

The figures in this document are typical values for reference only. The guaranteed values in the sales contract shall prevail. Users are responsible for testing products purchased from the Company to verify the suitability for the proposed process, application, and standards. As applications and processing of our products are affected by various factors, which are all beyond the control of the Company, thus users shall bear full responsibility. It is our duty to help customers solve technical issues that arise in the use of our products, but the Company shall not be liable for any indirect damages resulting from the technical support.

The Company shall not be liable for the following under any circumstances:

- Indirect, secondary, or incidental losses, or loss of potential profits;
- Losses of a third party other than the customer resulting from our products being resold, leased, or given;
- Losses in other raw materials purchased aside from our products, losses in labor or utility, or losses due to maintenance costs or the suspension of production.

INNOVATION CREATES EXCELLENCE