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NANOCON®

Nanocomposite Nylon 6

For Paintless Parts with Metallic Appearance

What is NANOCON® ?

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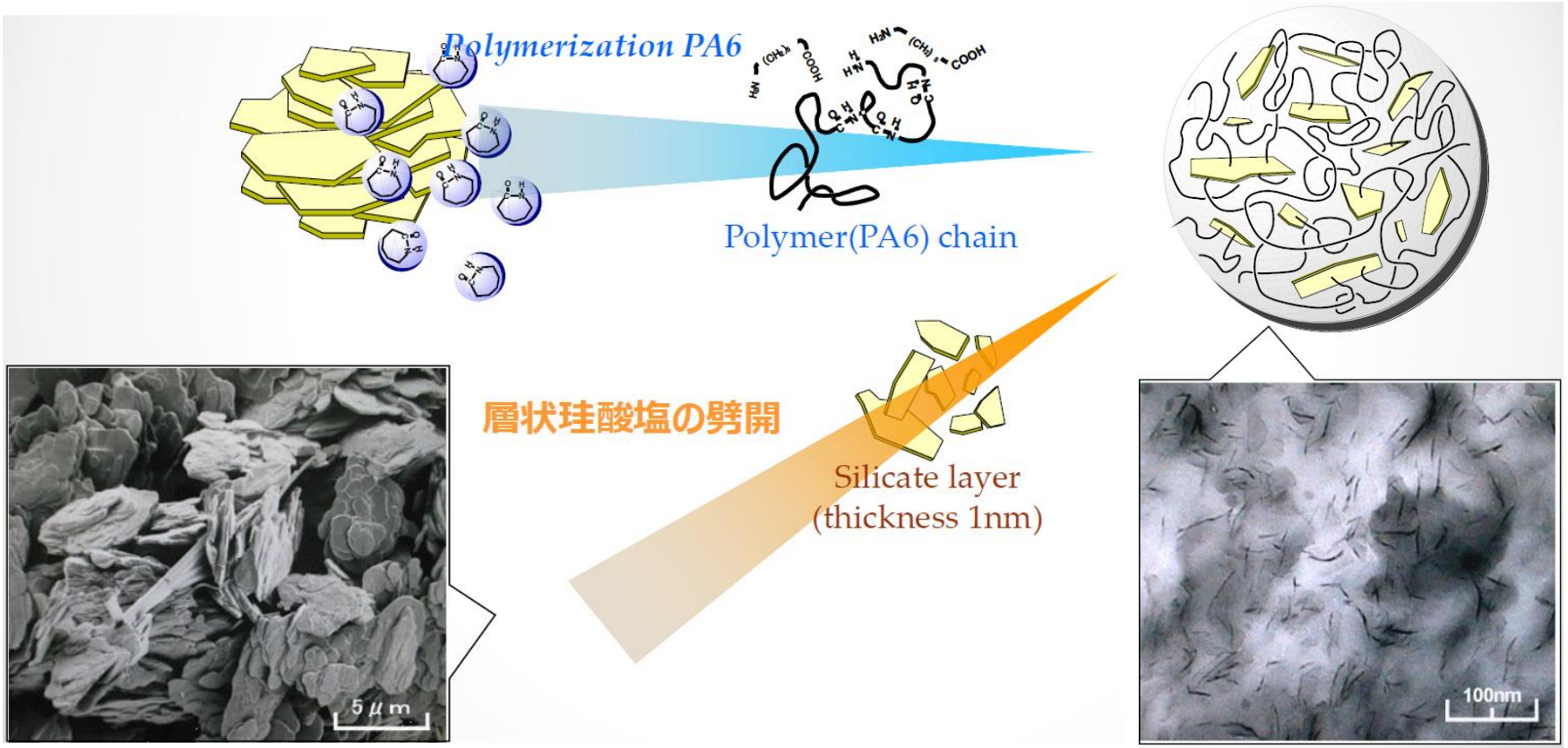
Unitika uses a unique method to disperse uniformly a nanometer ordered synthetic layered silicate (ultra-fine fillers of silicate sheets) in a nylon 6 matrix. As each silicate layer has almost the same size as a nylon 6 molecular chain itself, nanocomposite molding items have an excellent surface appearance compared with the conventional reinforced materials.



Main features of NANOCON®

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Excellent Appearance
Equivalent to unreinforced PA6

Chemical Resistance
Capable of automotive parts

Low Specific Gravity
1.15

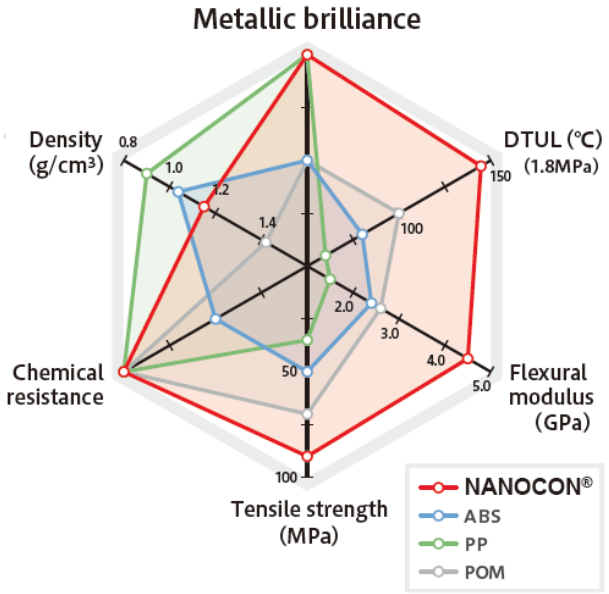
Nanocon®

High Heat Resistance
DTUL 152℃ (1.8MPa)

High Flexural Modulus
4.5GPa(Dry)

Good Moldability
High Flow Ability, Low flash

High Dimensional Stability
Low Warpage



Properties of NANOCON®

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	ISO method	単位	NANOCON® M1030DH	PA6+GF15	PA6+MD35	PA6
Specific Gravity	1183	g/cm³	1.15	1.23	1.40	1.13
Water absorption (23℃×50%RH)	62	%	2.8	2.4	1.8	2.8
Tensile stress at break	527-1	MPa	95	120	70	80
Tensile strain at break	-2	%	3	3	3	45
Tensile modulus		MPa	4300	5500	6400	2600
Flexural strength	178	MPa	155	170	120	100
Flexural modulus		MPa	4500	5000	6300	2500
Charpy impact strength (notched/an notched)	179-1eA	kJ/m²	4 / 57	7 / 23	3 / 41	4 / NB
Deflection temperature (1.8/0.45MPa)	75-1,-2	℃	140 /190	190 / 215	130 / 200	60/ 165
Coefficient of linear thermal expansion	11359-2	10^{-5}/℃	5.3	4.2	5.0	9.6
Mold shrinkage 3.2mmt (flow/transverse)		%	1.1/1.2	0.3-0.5 / 0.8-1.0	0.4 / 0.8	1.5/ 1.6

Excellent appearance

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Comparison of the morphology between NANOCON® and Conventional reinforced grade

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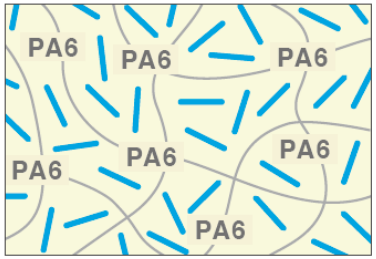
Layered silicate

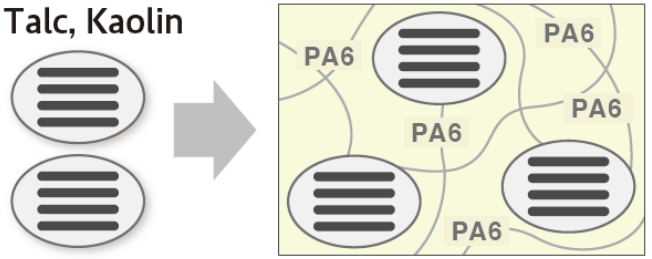
Filler is dispersed as molecule level.



It is produced by dispersing laminar silicate in nanometer size during polymerization.

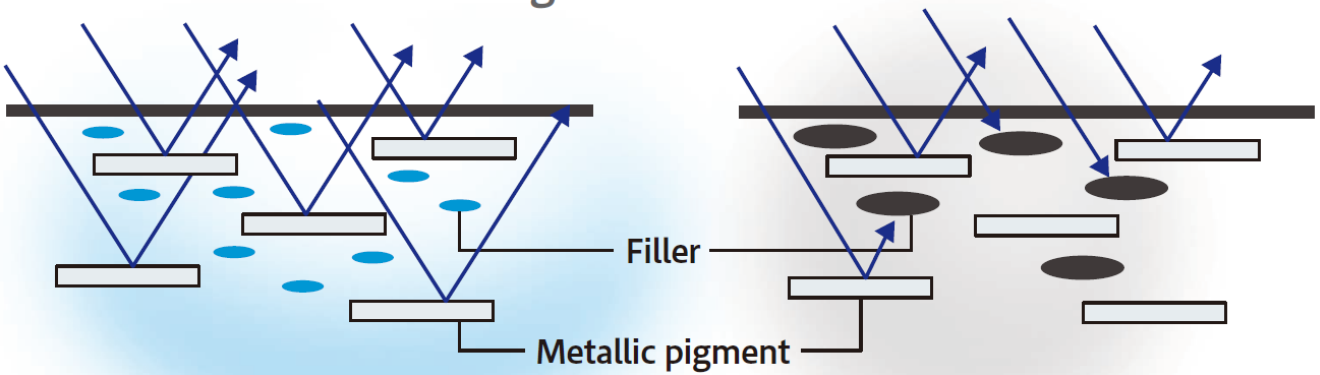
Conventional reinforced grade
Talc, Kaolin

Filler is dispersed in lump segment.



Inorganic mineral filler are mechanically compounded with polymer.

Visible light: λ =200～800nm



NANOCON®
(Particle diameter : 30nm)

Mineral reinforced Nylon
(Particle diameter : 3～6μm)

Excellent appearance

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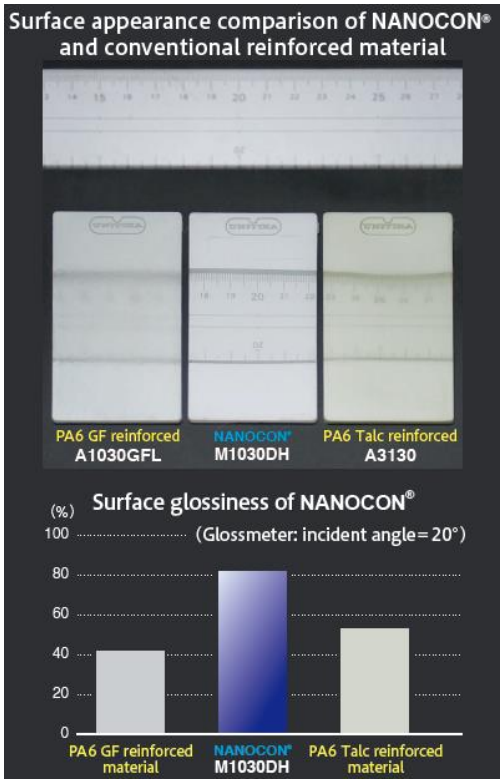

Metallic pigments in **NANOCON®** shine brilliantly because the synthetic layered silicate has fine white appearance compared with natural layered silicate and **NANOCON®** itself is uncolored.

Low specific gravity/high stiffness

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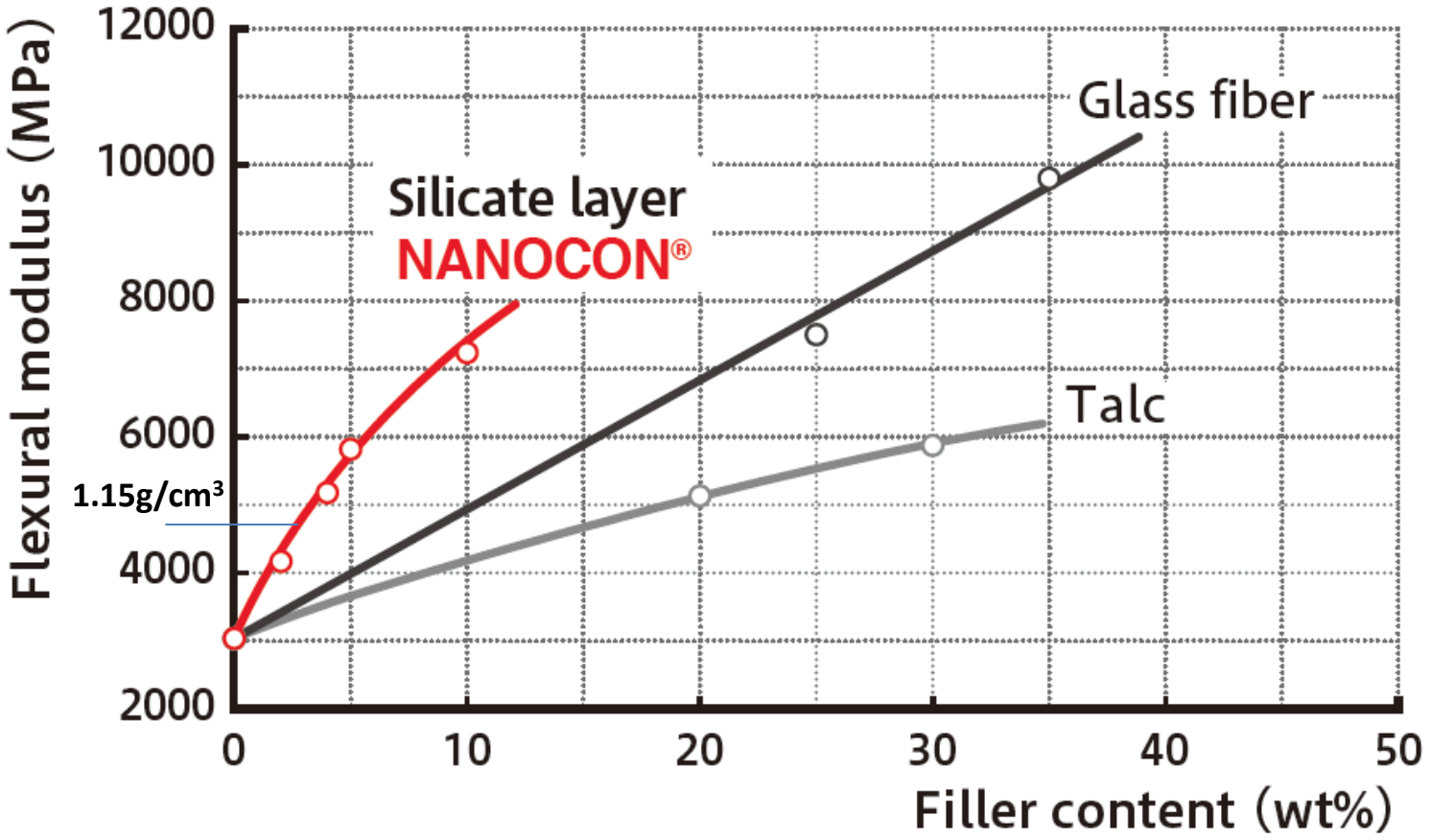
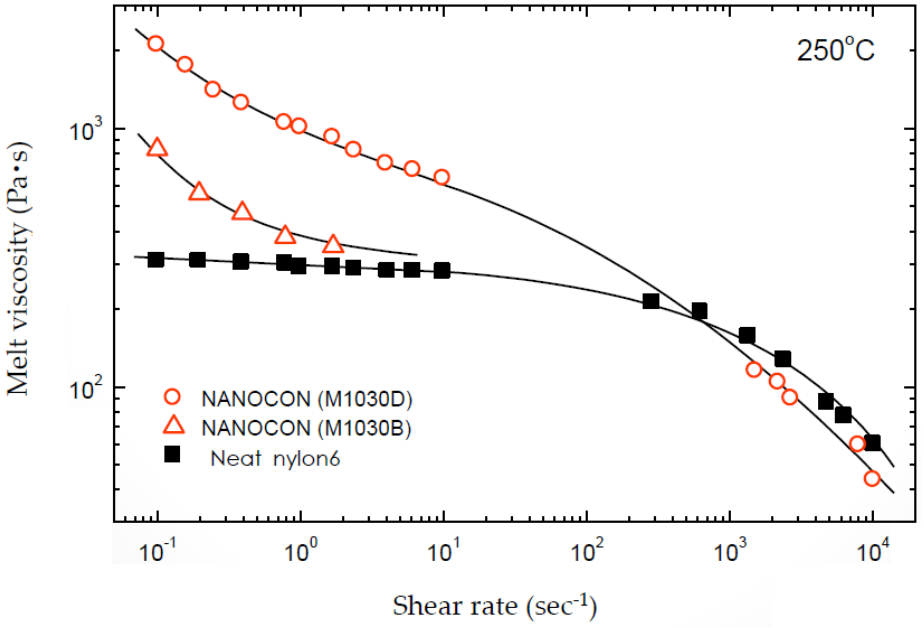
Because layered silicate reinforces polyamide 6 very efficiently, **NANOCON®** is as stiff as conventional reinforced polyamide 6 with higher filler content. That's why **NANOCON®** realize to combine both stiffness and weight reduction.

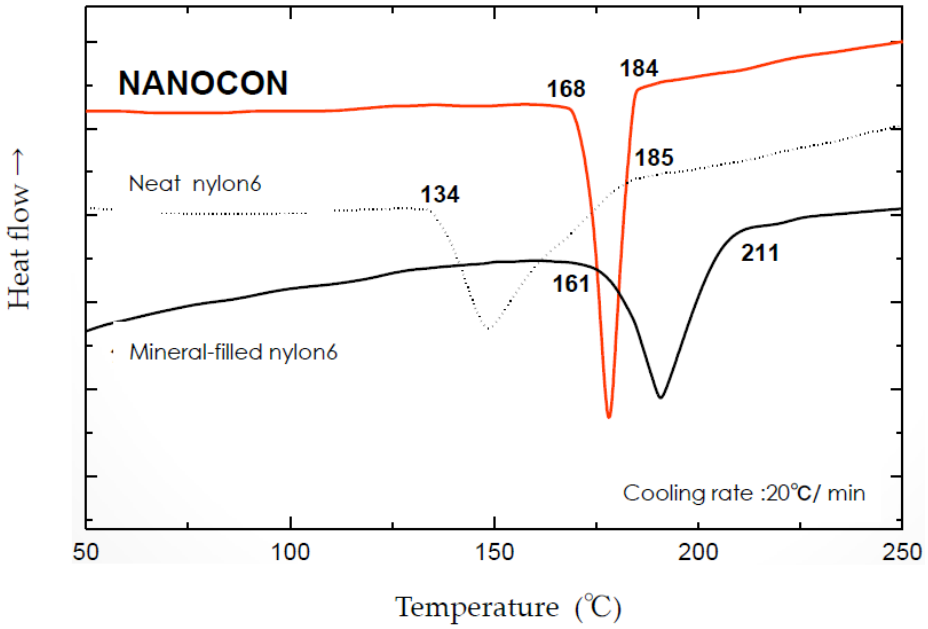


Filler content dependence of Flexural modulus

Good mouldability

Numerous shape anisotropic filler of silicate layer dispersed into the nylon6 matrix bring about a unique flow characteristics; the same flowability as the neat nylon6 in high shear rate region and urgent increase of melt viscosity in low share rate region. This contributes, for example, a low degree of fin or burr at injection molding.





Silicate layers also function as numerous nucleating agents dispersed into the matrix polymer, which leads high rate of crystallization contributing a short molding time.

Low degree of fin and burr, short molding time and good mold release

High dimensional stability

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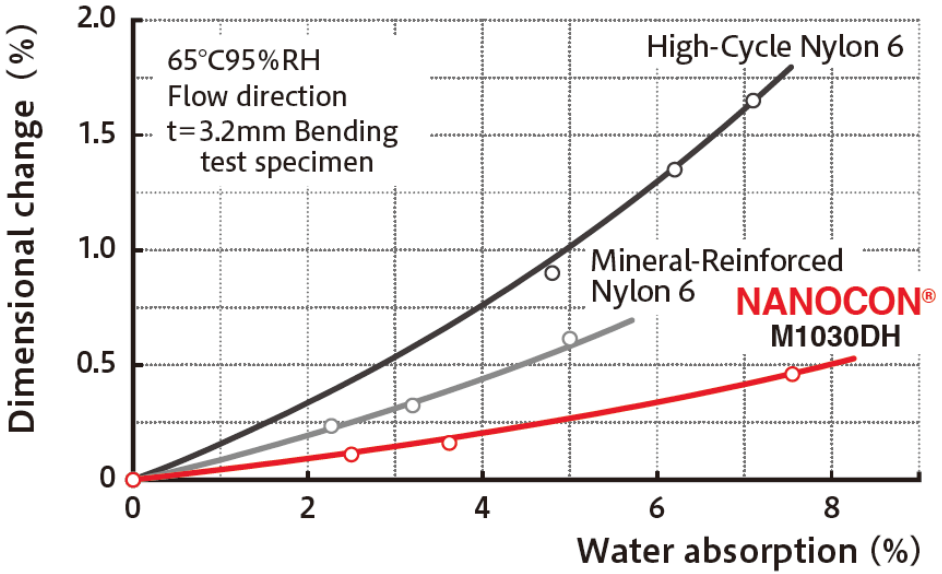
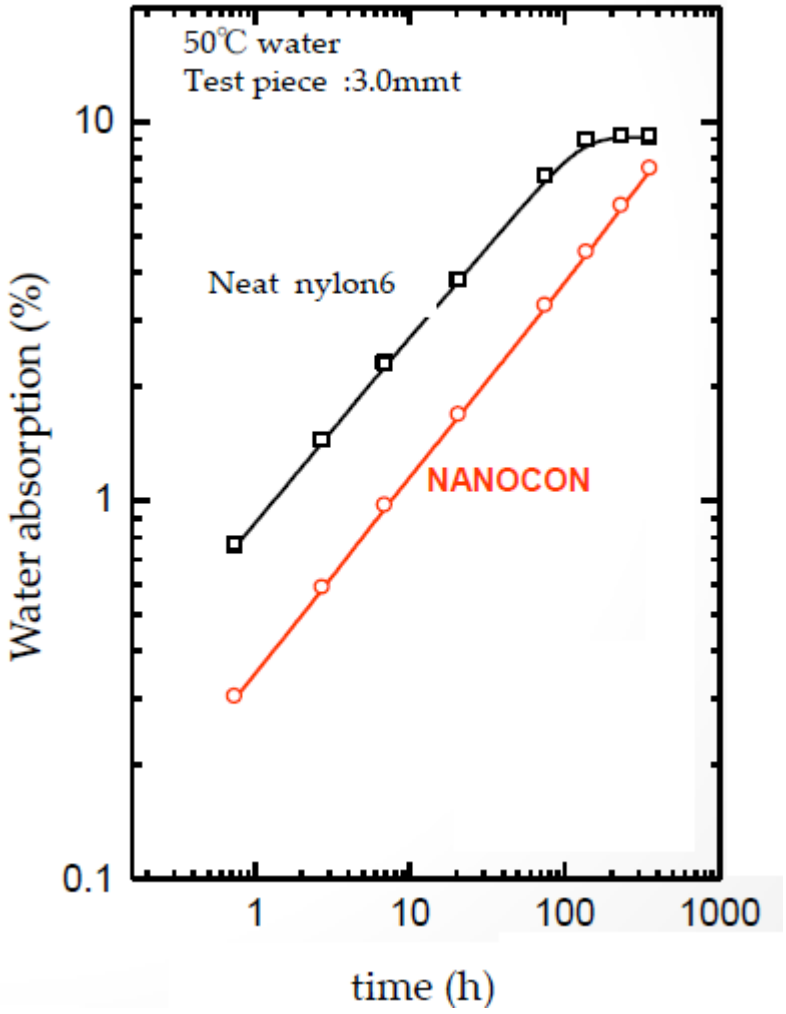
NANOCON® has dimensional changes associated with water absorption is smaller than the talc-reinforced, because strong interaction with silicate sheets and polyamide6 molecular chain. **NANOCON®** has excellent dimensional stability and a slow absorption speed.



Dimensional change by water absorption



High dimensional stability and small change in mechanical property under water absorption condition

Low warpage

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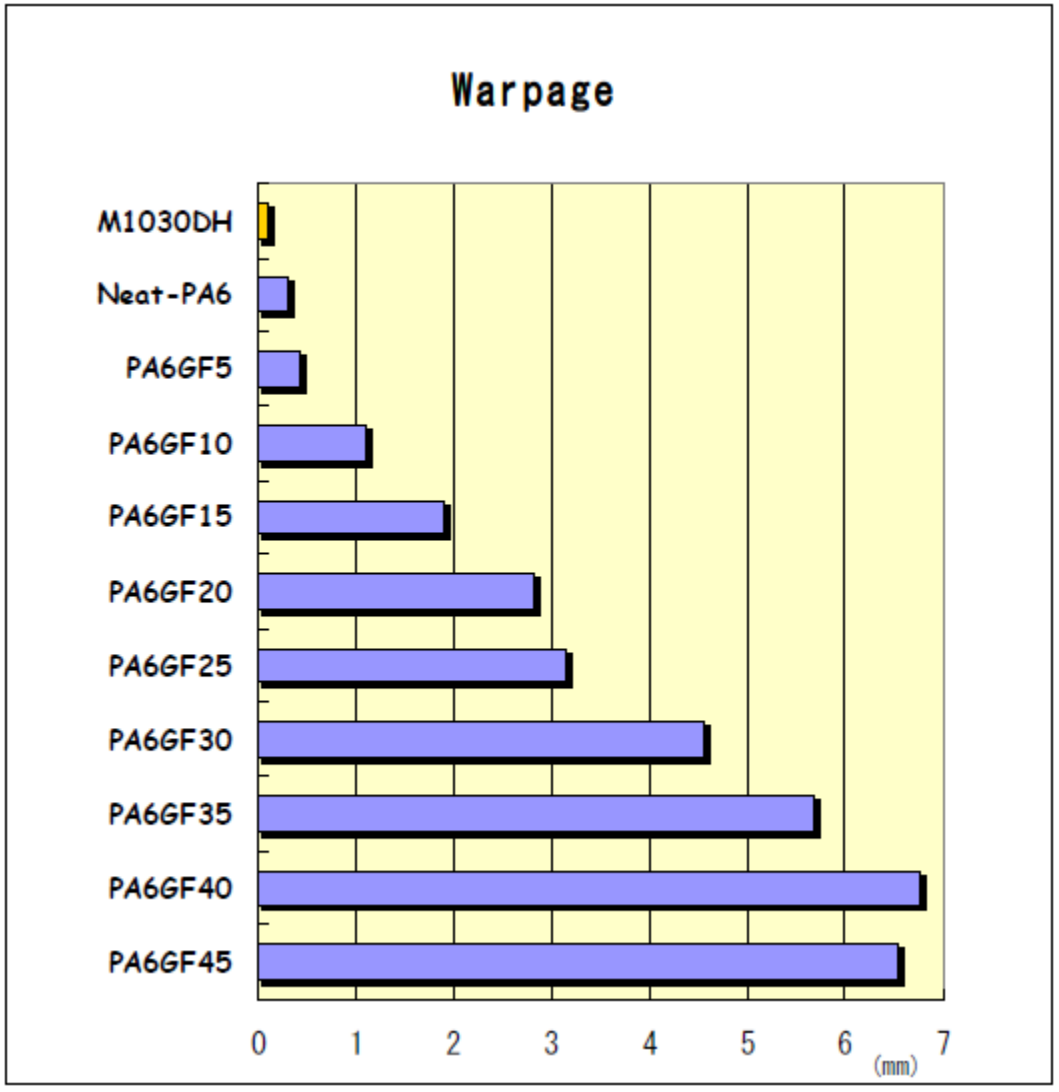
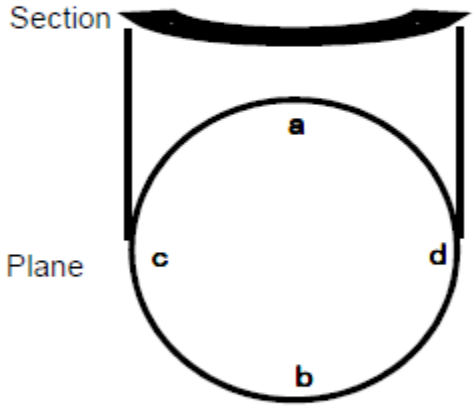


Test Piece	: Disk (100Φ 1.6mmt)
Cylinder Temp.	: 260℃
Tool Temp.	: 80℃
Injection Speed	: High



Measurement Method

Degree of Warping = (c + d)/ 2 – (a + b)/ 2

a and b ; on the ground

c and d ; max points of warping up

Good recyclability

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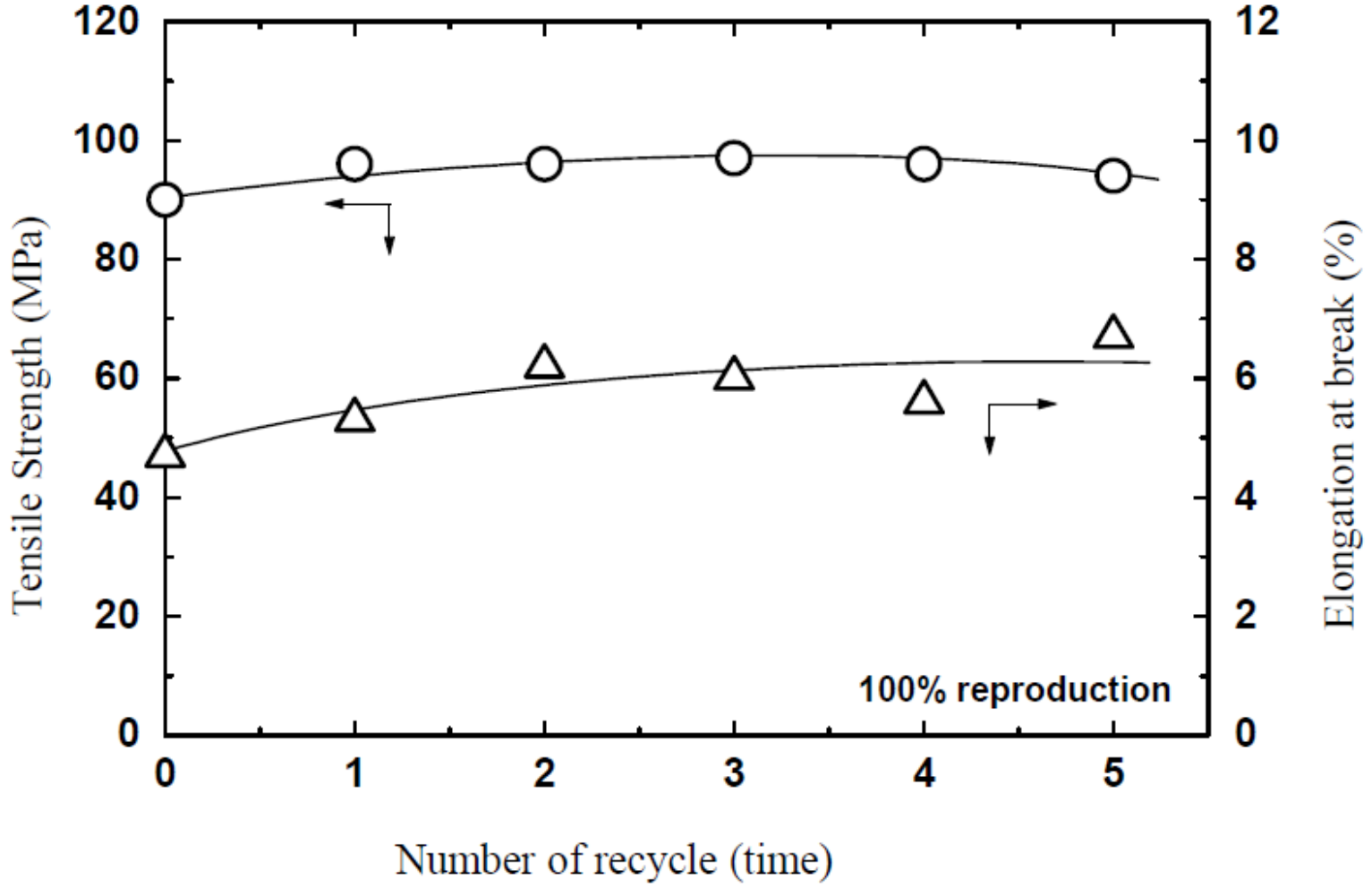
Both ultra-fineness of silicate layer and ionic interaction, thereby thermally reversible, between the fillers and polymer chains bring about a unique property of reproducibility. Almost no influences on mechanical properties are displayed after 4～5 times whole reproduction.



Possible applications

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Outstanding brilliance and strength

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Processing recommendations

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○DRYING

①Natural and Non-metallic colored material

Since we supply the dried material , It is not necessary to dry the material which is not opened.

②Metallic colored material

M1030DH-X is not dried.! Please be sure to mold after drying.

dryer	temperature (℃)	time (hr)
Defumidifying type	**80℃~100℃**	Over 1 2h

Attention: when a tray dryer of hot air circulation type is used, material may discolor.

○Molding condition

	Unit	Setup
Cylinder Temp. Nozzle	℃	240~260
Cylinder Temp. Front	℃	240~260
Cylinder Temp. Middle	℃	230~250
Cylinder Temp. Back	℃	230~240
Injection Pres.	MPa	Low~High
Tool Temp.	℃	70~100

Processing recommendations

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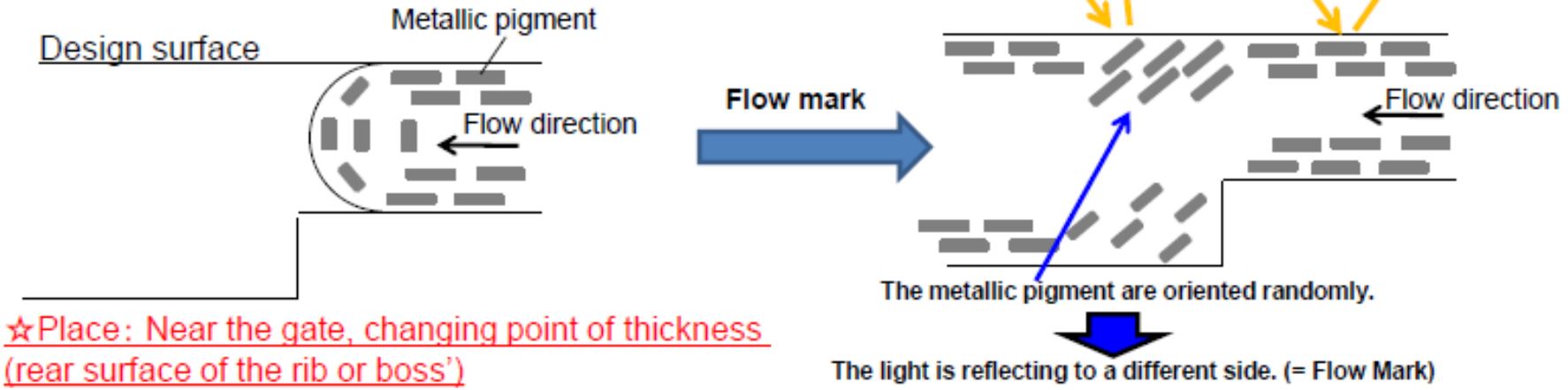
Molding technology for good METALLIC APPEARANCE

Mechanism of flow mark



☆Place: Near the gate, changing point of thickness (rear surface of the rib or boss')

The occasion and countermeasure for appearance fault of metallic color resin

fault	occasion	area	proposal condition
Flow mark	orientation disarray of metallic pigment	gate	decrease of melt resin injection speed through gate
		background of rib	mold design: decrease of rib thickness condition: change of injection speed
		all case	increase of cylinder temperature(C1,C2)
			increase of back pressure
			use more dark color
Weld line	vertical orientation of metallic pigment	joint portion	mold design : heat & cool, disk gate

Preferred condition

grade	M1030DH HU-X552
gate of mold	fan gate
cylinder temp.	230～250℃
mold tenmp.	80～110℃
injection speed	V1: 1～50mm/s
	V2: 50mm/s

Advantages of paintless metallic plastic

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No paint material is wasted

Never peels off

Rust-proof

No defects hidden under the surface

No energy consumed by air compressor

Paintless metallic plastic can be recycled

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For further contact please contact:

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Disclaimer

Unless specified to the contrary, the values given have been established on standardized test specimen at room temperature. The figures should be regarded as guide values only and not as binding minimum values. Kindly note that, under certain conditions, the properties can be affected to a considerable extent by the design of the mold, the processing conditions and the coloring.

- Freedom under patents, copyright and registered designs cannot be assumed.
- The information provided here is accurate to the best of our knowledge, based on all information and data available at this time, and is subject to change without notice.
- It is provided with no guarantee or assumption of liability whatsoever.
- It applies only to the normal handling and use of ***Nanocon®*** as a molding material. Any other use or application would necessitate additional, special safety precautions, and is not recommended.
- Under the recommended processing conditions small quantities of decomposition product may be given off during processing. To preclude any risk to the health and well-being of the machine operatives, tolerance limits for the work environment must be ensured by the provision of efficient exhaust ventilation and fresh air at the workplace in accordance with the Material Safety Data Sheet. In order to prevent the partial decomposition of the polymer and the generation of volatile decomposition products, the prescribed processing temperatures should not be substantially exceeded. Since excessively high temperatures are generally the result of operator error or defects in the heating system, special care and controls are essential in these areas.

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UNITIKA NANO-COMPOSITE NYLON6

高輝度メタリック着色樹脂

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UNITIKA NANO-COMPOSITE NYLON6

Metallic Color Collection (Silver)

X591	X590	X589	X584

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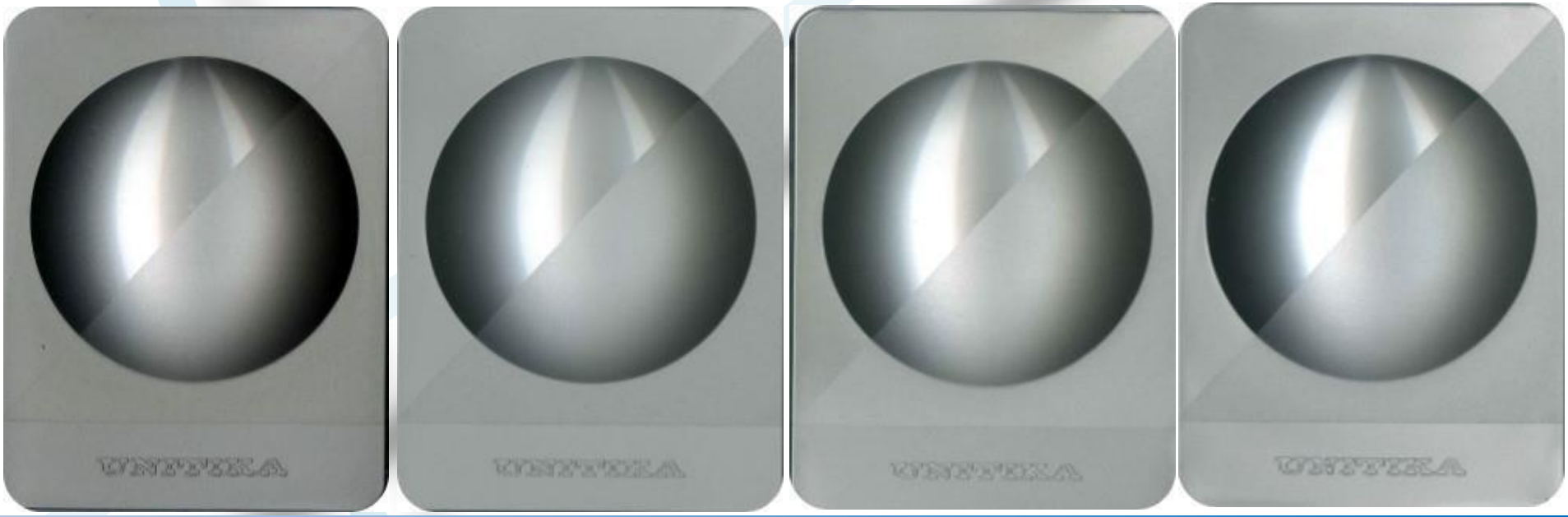
UNITIKA NANO-COMPOSITE NYLON6

Metallic Color Collection (Silver)



X564	X572	X552	X551

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UNITIKA NANO-COMPOSITE NYLON6

Metallic Color Collection (Silver)

X594	X561	X558	X573

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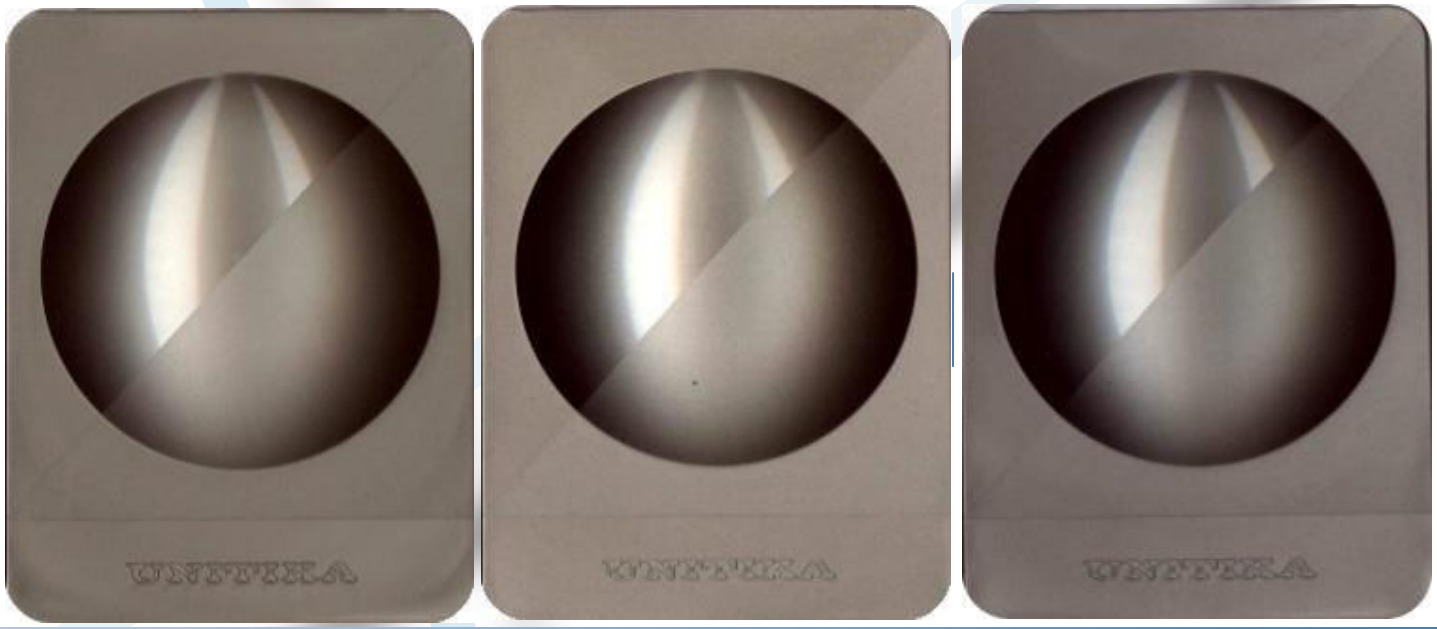
UNITIKA NANO-COMPOSITE NYLON6

Metallic Color Collection (Silver)



X579	X582	X595

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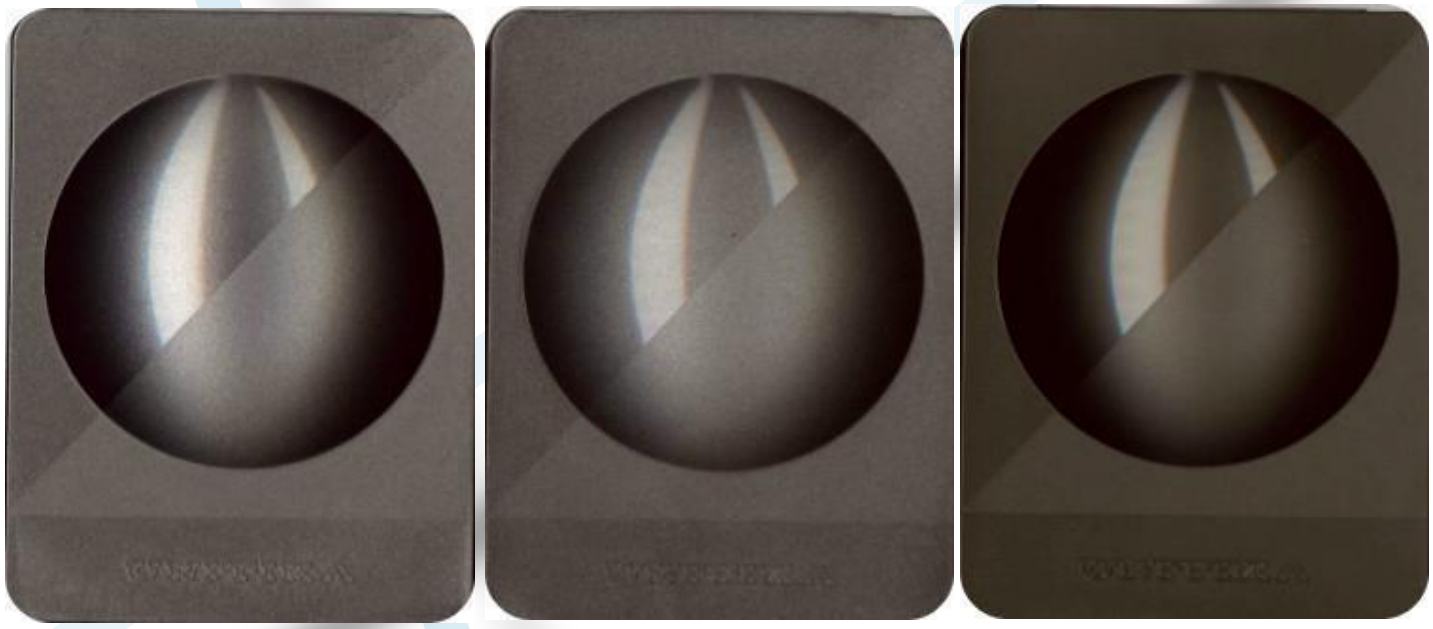
UNITIKA NANO-COMPOSITE NYLON6

Metallic Color Collection (Silver)



D581 X529 X587

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UNITIKA NANO-COMPOSITE NYLON6

Metallic Color Collection (Silver)

X592 X593

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UNITIKA NANO-COMPOSITE NYLON6

Metallic Color Collection (Gold)

X585	Z517	Z518

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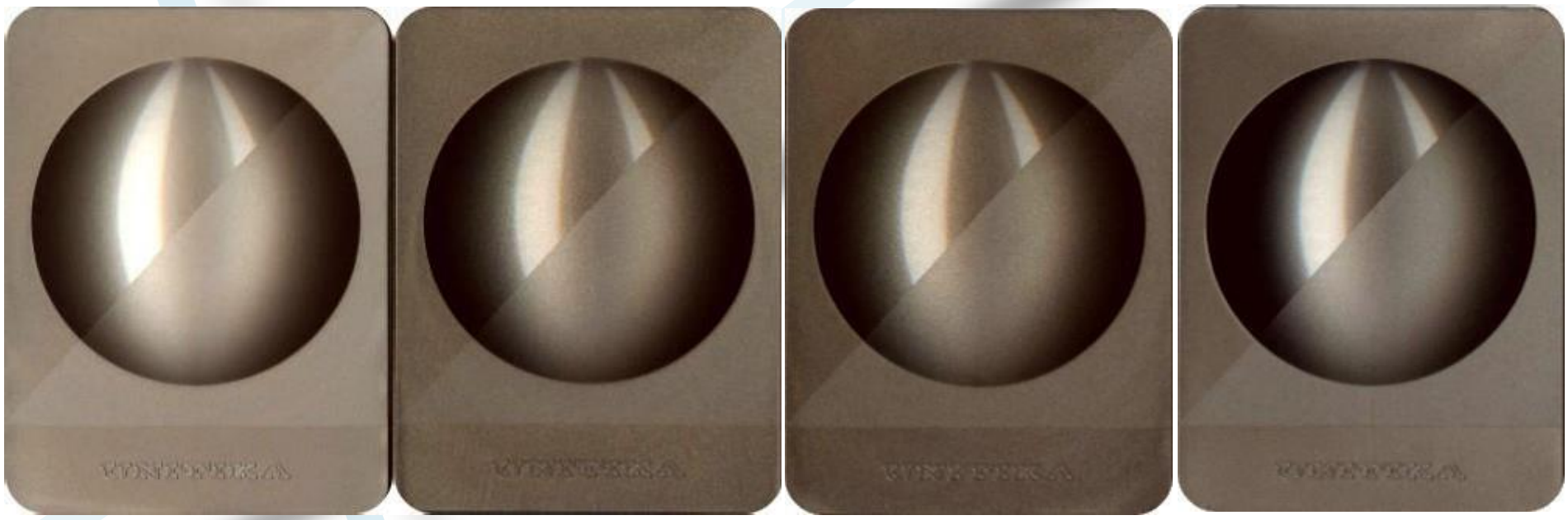
UNITIKA NANO-COMPOSITE NYLON6

Metallic Color Collection (Gold)



Z521	Z520	Z505	X586

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UNITIKA NANO-COMPOSITE NYLON6

Metallic Color Collection (Gold)

Z514	Z512	Z511

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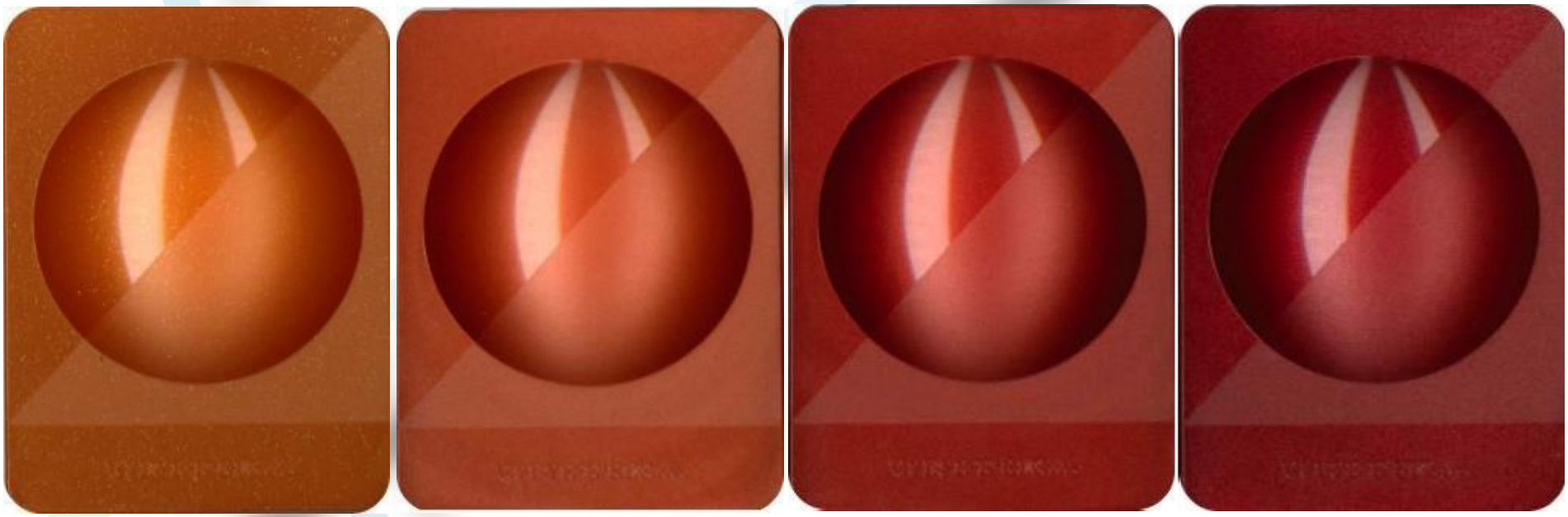
UNITIKA NANO-COMPOSITE NYLON6

Metallic Color Collection (Red)



C535	R569	R568	R553

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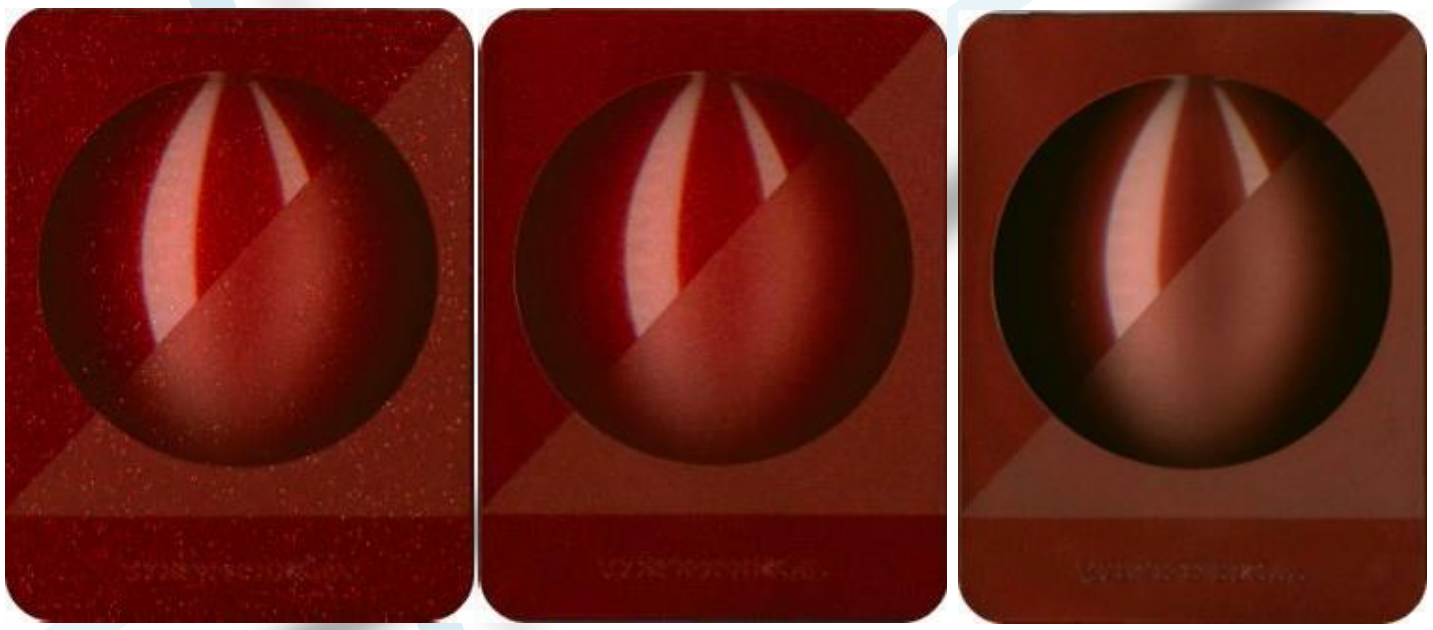
UNITIKA NANO-COMPOSITE NYLON6

Metallic Color Collection (Red)



R565	R567	R560

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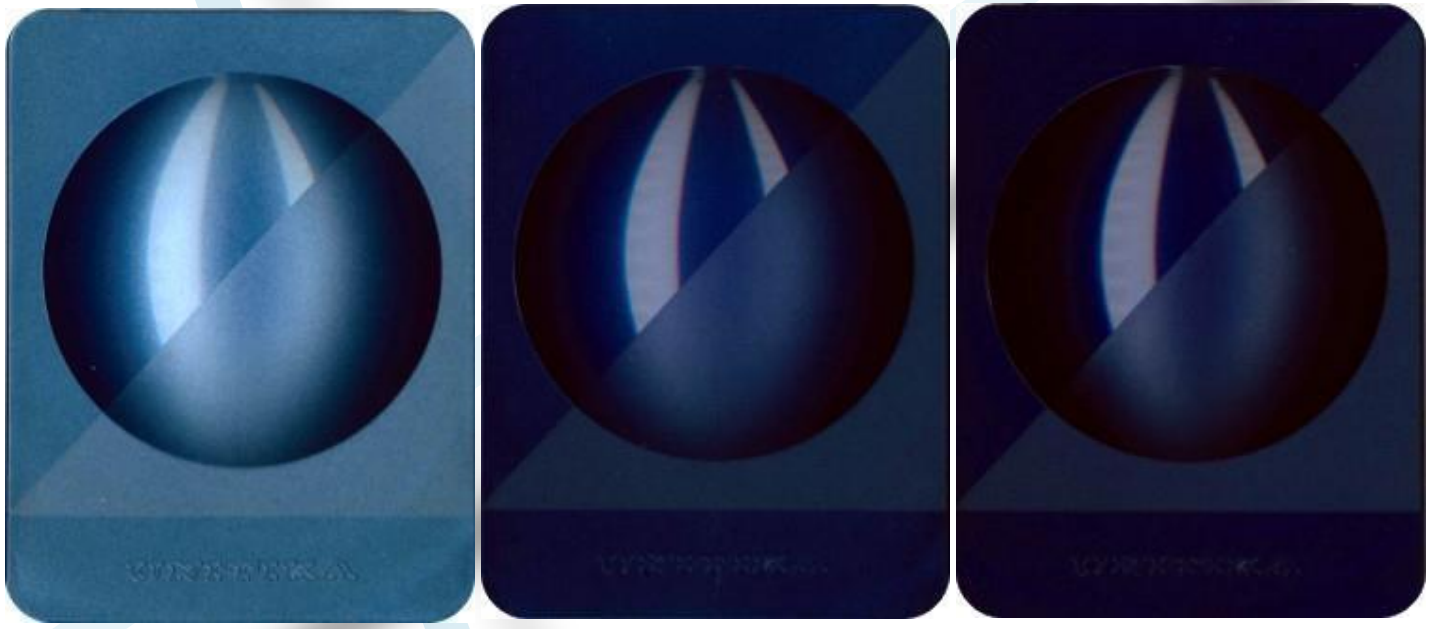
UNITIKA NANO-COMPOSITE NYLON6

Metallic Color Collection (Blue)



B554	B564	B567

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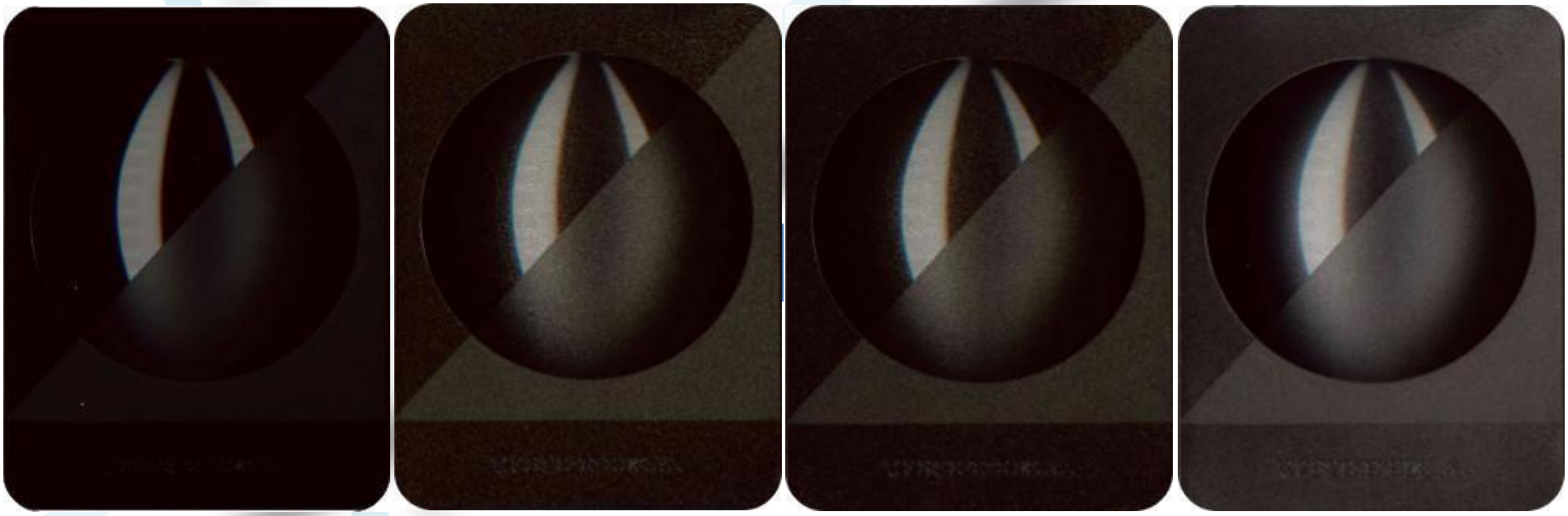
UNITIKA NANO-COMPOSITE NYLON6

Metallic Color Collection (Black)



PBK	S554	S549	S562

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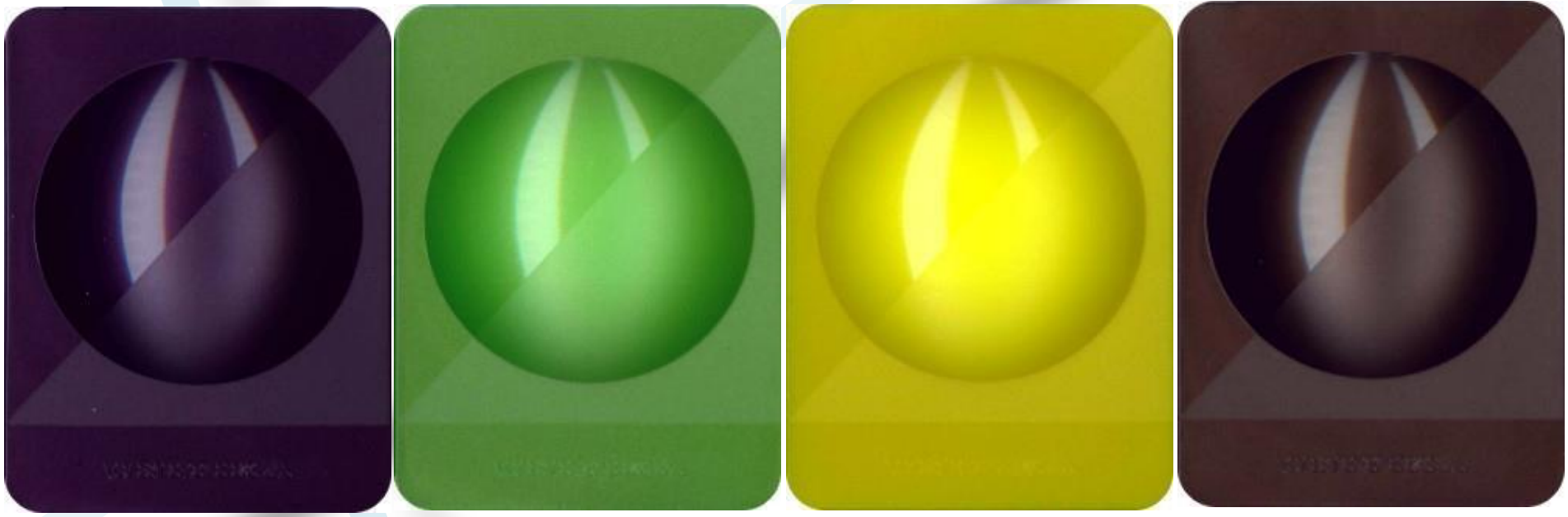
UNITIKA NANO-COMPOSITE NYLON6

Metallic Color Collection (Other)



V509	G552	Y537	Z510

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