The New flame retardant PP for Battery Enclosure Materials by using Long Glass Fiber Reinforced PP

JPP & MUS

September 2025

Japan Polypropylene Corporation
1-Toho-cho, Yokkaichi, Mie
510-0848 JAPAN

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- Introduction of Company
- Our Products
- About FUNCSTER™
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- Summary

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Global Network of Japan Polypropylene Company

Japan Polypropylene

JPF Asia (Changshu) Co., Ltd.

Beijing Ju-Ling-Yan Plastic Company Limited*

Mytex Polymers US Corp

Mytex Polymers India Pvt.Ltd.

Japan Polypropylene Corp.

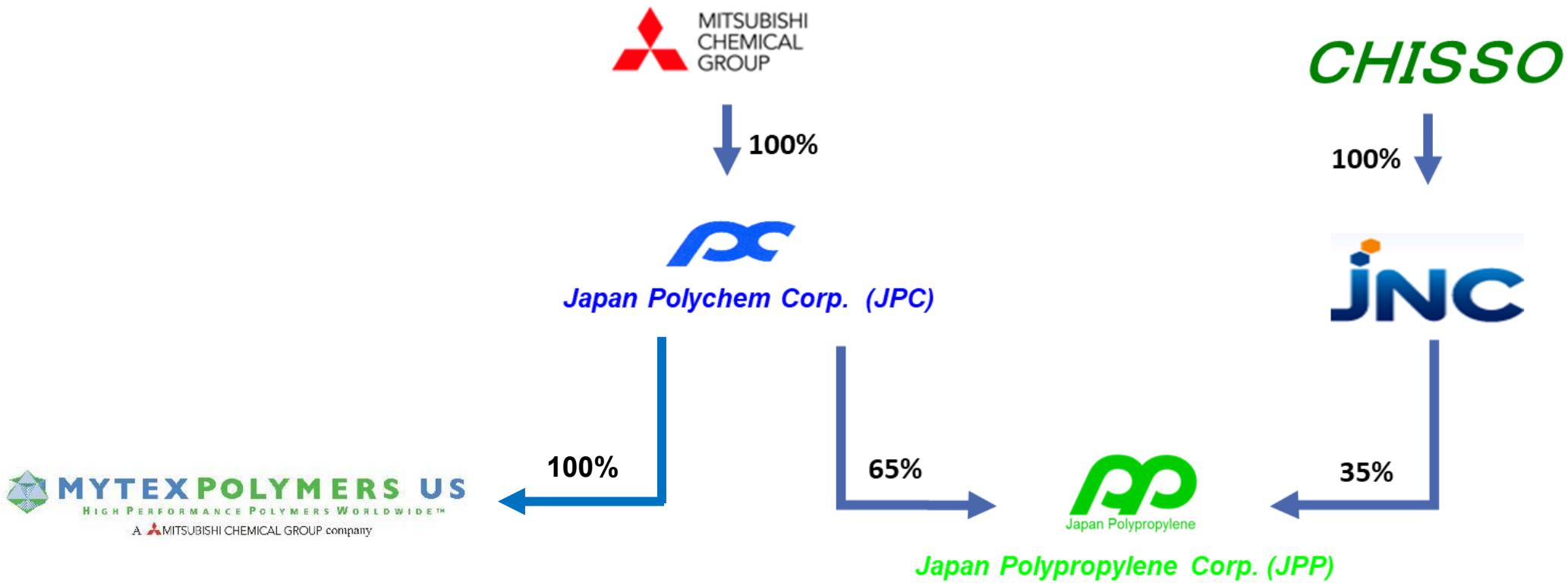
Mytex Polymers （Thailand）Co.,Ltd.

Mytex Polymers de Mexico, S.A. de C.V.（Sales Office）

MYTEX POLYMERS US
HIGH PERFORMANCE POLYMERS WORLDWIDE™
A MITSUBISHI CHEMICAL GROUP company

Corporate Outline of JPP and Mytex

■ Capital Relationship



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HIGH PERFORMANCE POLYMERS WORLDWIDE™
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Corporate Outline of JPP

Japan Polypropylene

■ Business Name

Japan Polypropylene Corporation

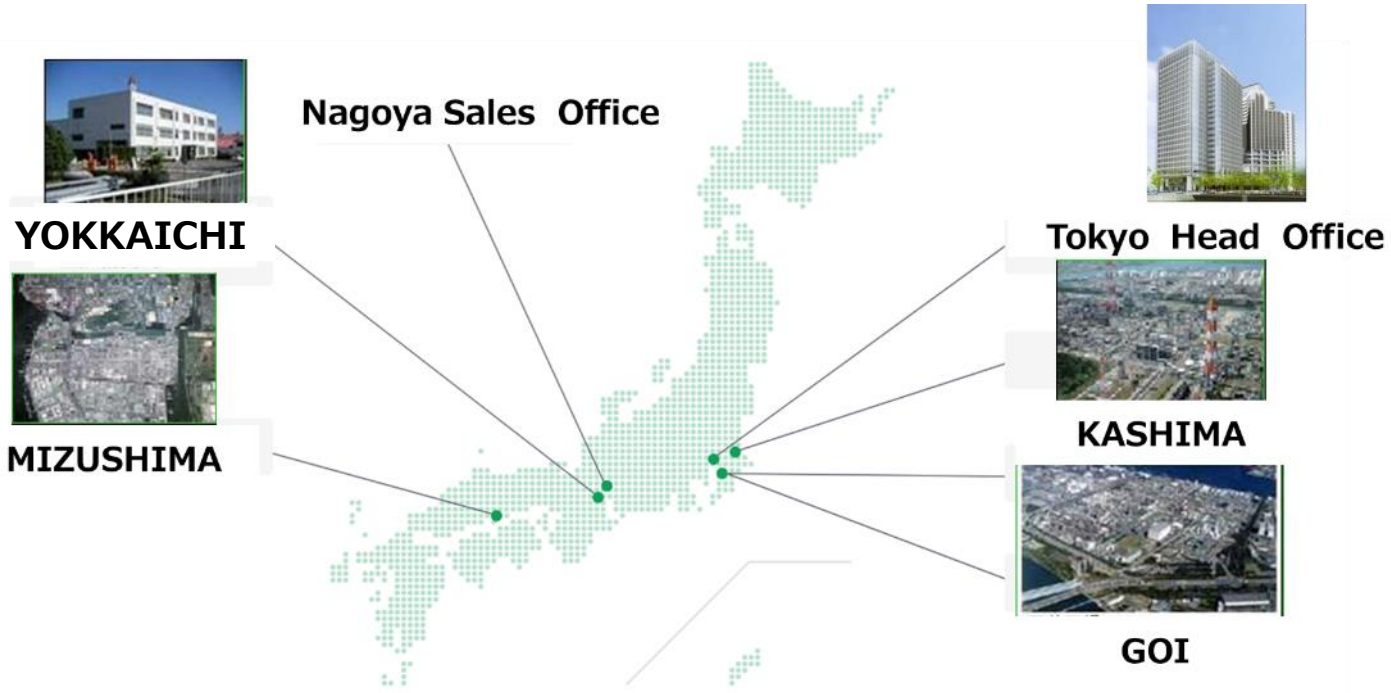
■ Established

Oct. 1, 2003

■ Business Scope

PP resin manufacture, sale, and research and development

■ Business Locations



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Corporate Outline of MYTEX

Japan Polypropylene

1987: Established as a 50/50 JV with Exxon & Mitsubish

1996: Beginning in-house production in Indiana

2006: In Jun., wholly owned by MCC

2014: In Feb., wholly owned by JPP

2018: In Oct., COMUSA (GA) merge with Mytex US.

2021: In Jul., wholly owned by JPC

Indiana Plant

- Located in Jeffersonville, Indiana
- Dedicated 1996
- 30 Acre Parcel 235,000 ft^2 Total (2 buildings)
- Full accredited laboratory .

Georgia Plant 1

Located in Covington, GA

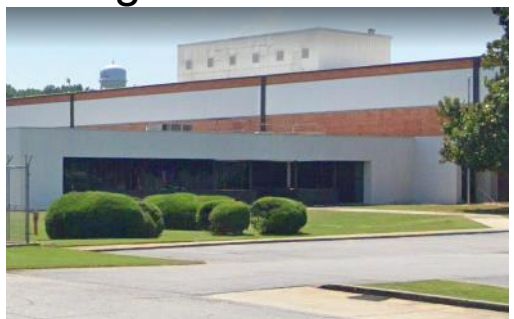
PLANT 1

- Established in 2005
- 35,000 Square Feet built inside Fibervisions
- ISO-9001:2015 Quality System certified

PLANT 2 from 2023

- Established in 2020
- 180,000 Square Feet

Georgia Plant 2



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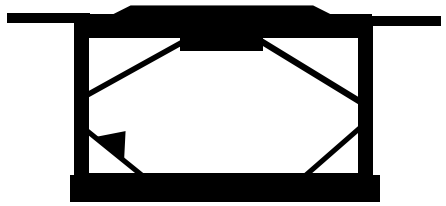
Contents

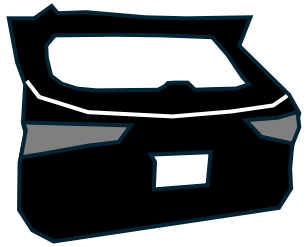
Automotive Application

Japan Polypropylene

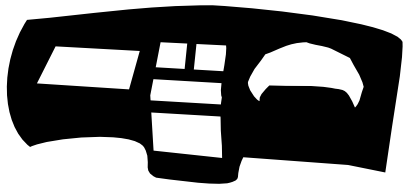
1 Front End Module Bolster



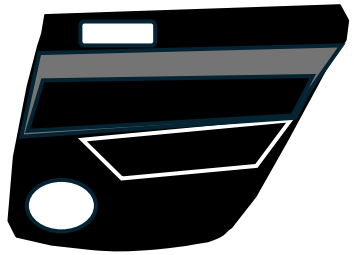
2 Back Door Outer & Inner

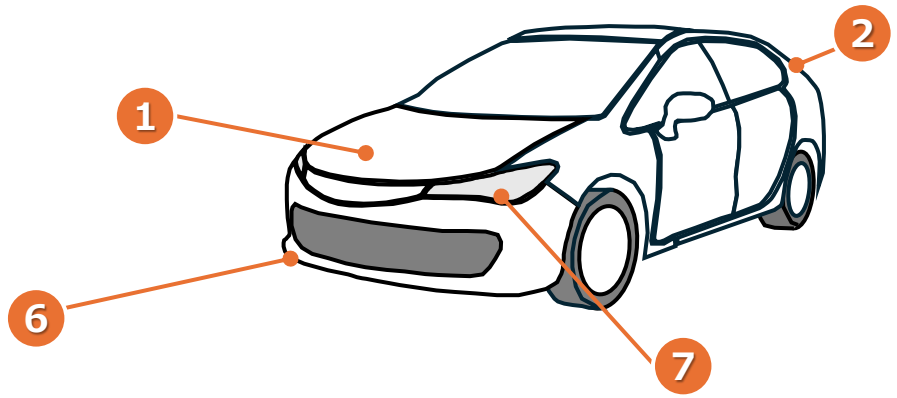


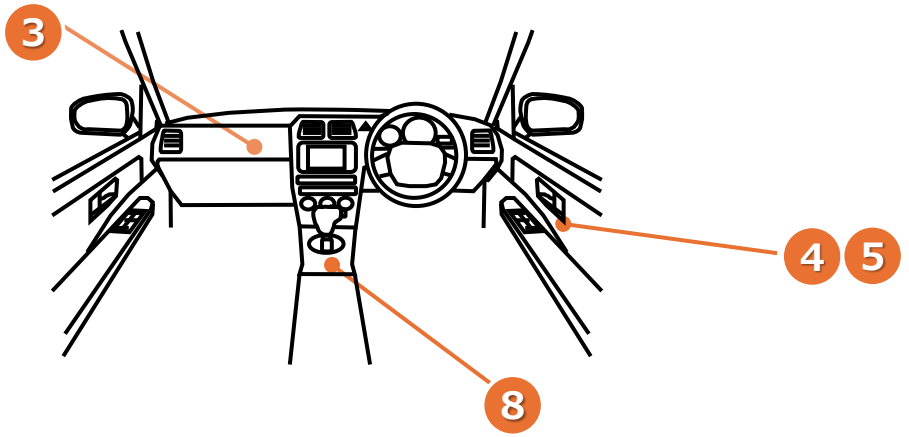
3 Instrument Panel



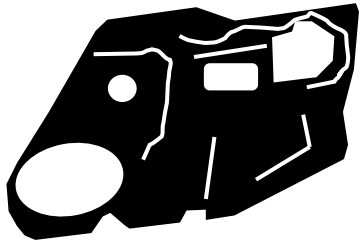
4 Door Trim







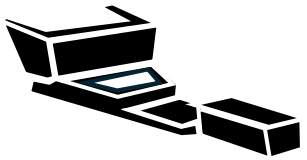
5 Door Module Plate



6 Bumper fascia

7 Ramp Housing

8 Center Console



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Green Specialty Company

Japan Polypropylene

High Performance Polymers Worldwide

- PCR
- Chemical recycle
- Bio polymer

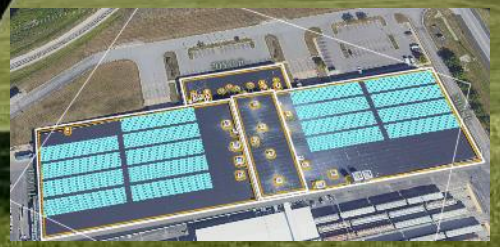
Raw Material

Involvement to recycle

Investment to a recycling company?

Energy Saving

Solar Panel



Green Specialty Company

Product

CR-PP | MR-PP | Bio Based Elastomer | PIR-Talc

MYTEX POLYMERS US
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Product Lineup

NOVATEC™

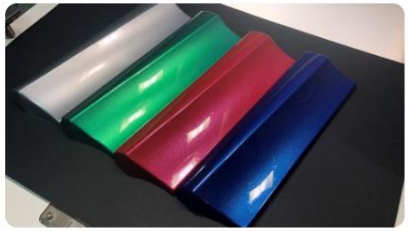
NOVATEC™ can be used for extensive application.
We prepare various PP lineups from daily and industrial use to Food, Medical, Automotive applications.

WINTEC ™

WINTEC™ shows many superior material performances such as Cleanness and high Level of Transparency, due to its highly controlled molecular structures. We can also provide PP with Very Low Melting Point (125℃) .

WAYMAX ™

Long Chain Branched High-Melt-strength PP WAYMAX™ can improve various forming such as Foaming, Thermoforming, etc. Since it is non crosslinked and does not have gels, it can also be used as modifier for film processing. It also shows good recyclabity.



NOVAORBIS ™

NOVAORBIS™ is raw material that have a low impact on the environment, as opposed to conventional products made from fossil fuels.

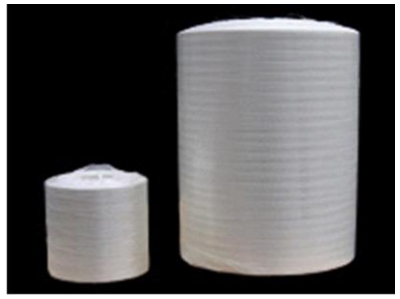
FUNCSTER™

FUNCSTER™ is high performance polypropylene contains long glass fiber. It is made by JPP's unique melt pultrusion process. FUNCSTER™ is applied to various structural and functionalized parts, can achieve weight reduction.

Contents

What is FUNCSTER™

FUNCSTER™ is a high-performance long glass fiber (LGF) reinforced thermoplastic resin developed by original melt pultrusion process.



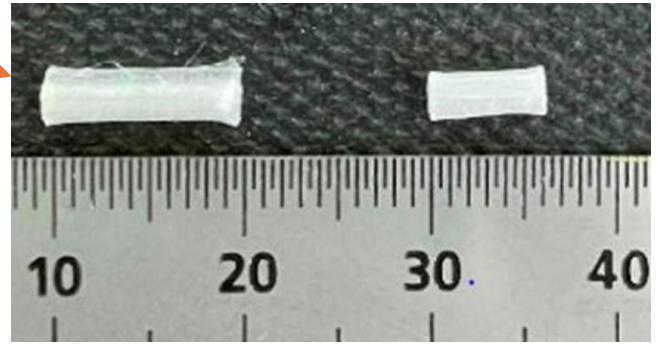
GF Roving

PP+additives

pellets shape

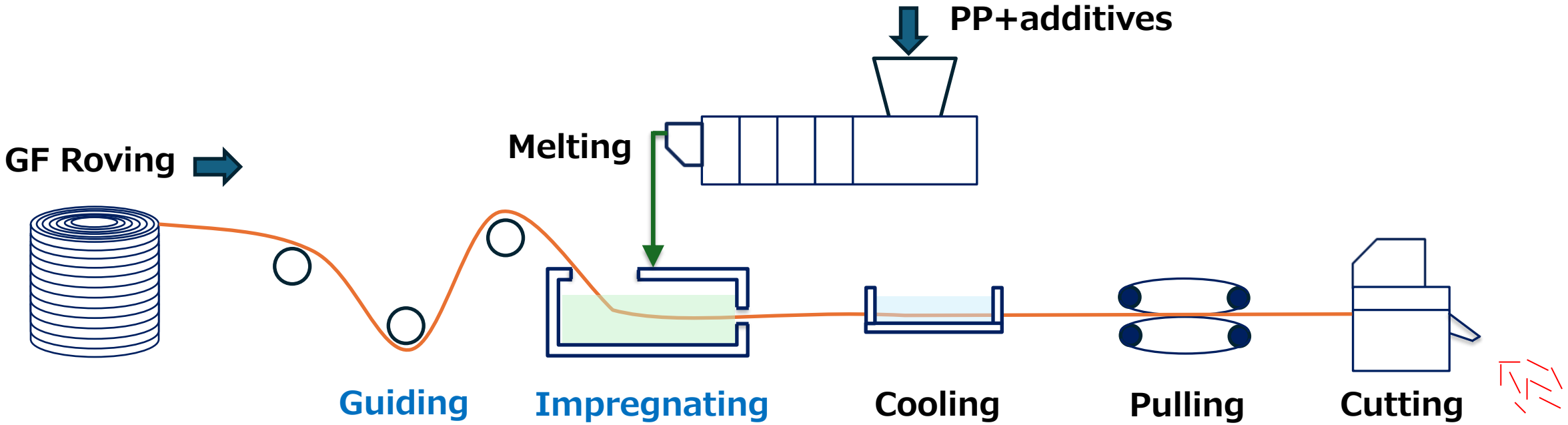
Melt pultrusion

FUNCSTER™



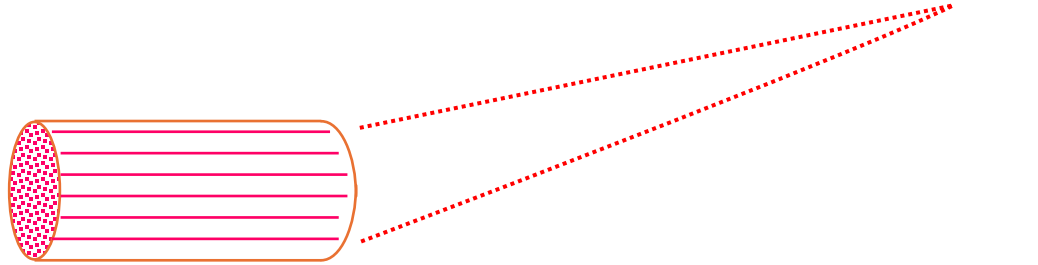
Long Fiber Materials
(Pellet length = GF length)

Melt Pultrusion Process



Core Technology

- Uniformly shape
  ⇒ little fluff, GF bundle and broken
- Uniformly morphology
  ⇒ excellent performance



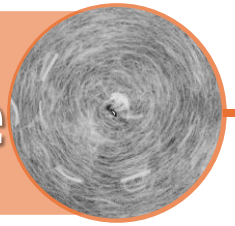
FUNCSTER™ has various features

Ex. See Next Page

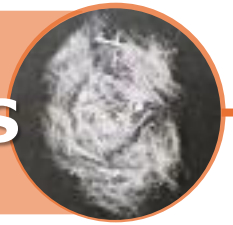
Features by FUNCSTER™ - ex. Back Door Inner -

Japan Polypropylene

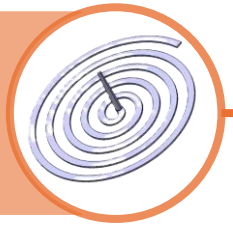
1. Little GF bundle



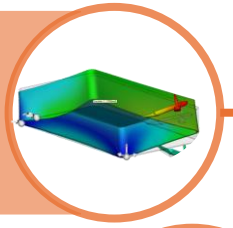
2. Little fluff fibers



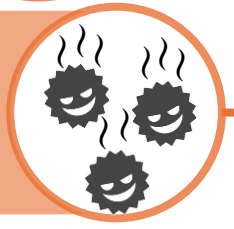
3. High Flow



4. Low Warpage



5. Low VOC

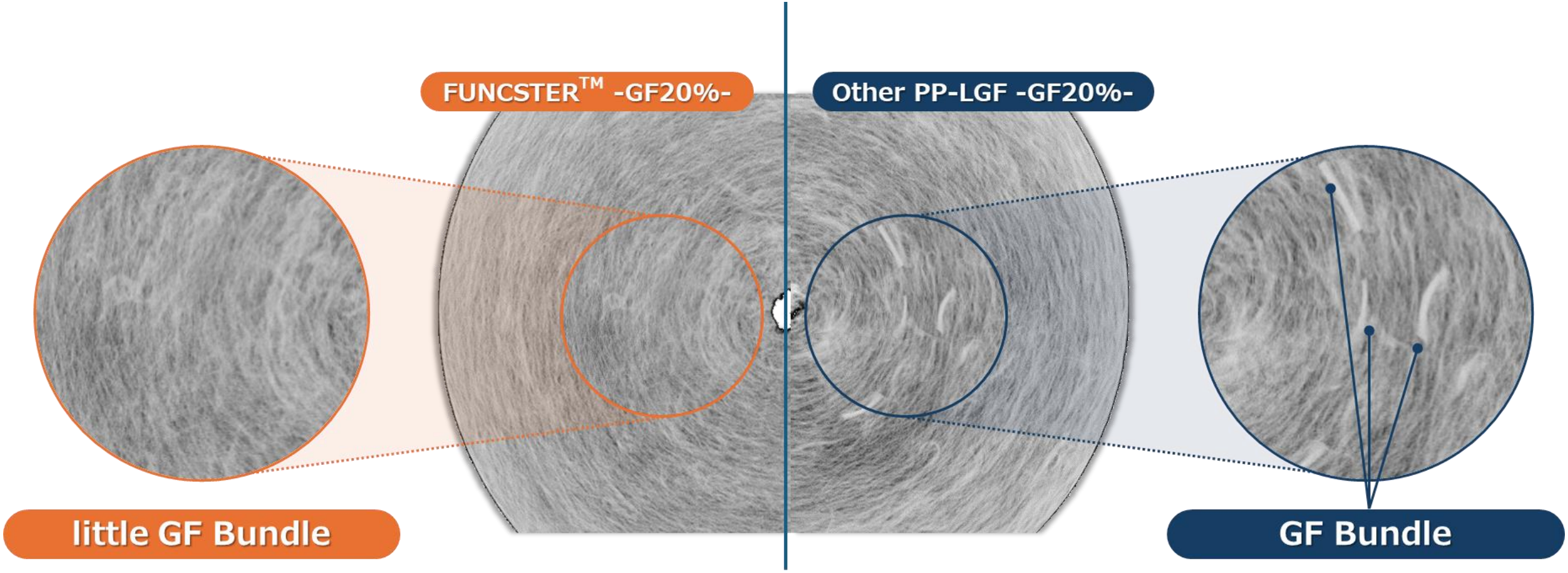


Back Door Inner

Glass fiber Dispersion

Japan Polypropylene

FUNCSTER™ has excellent GF dispersion (little GF bundle) in molded articles



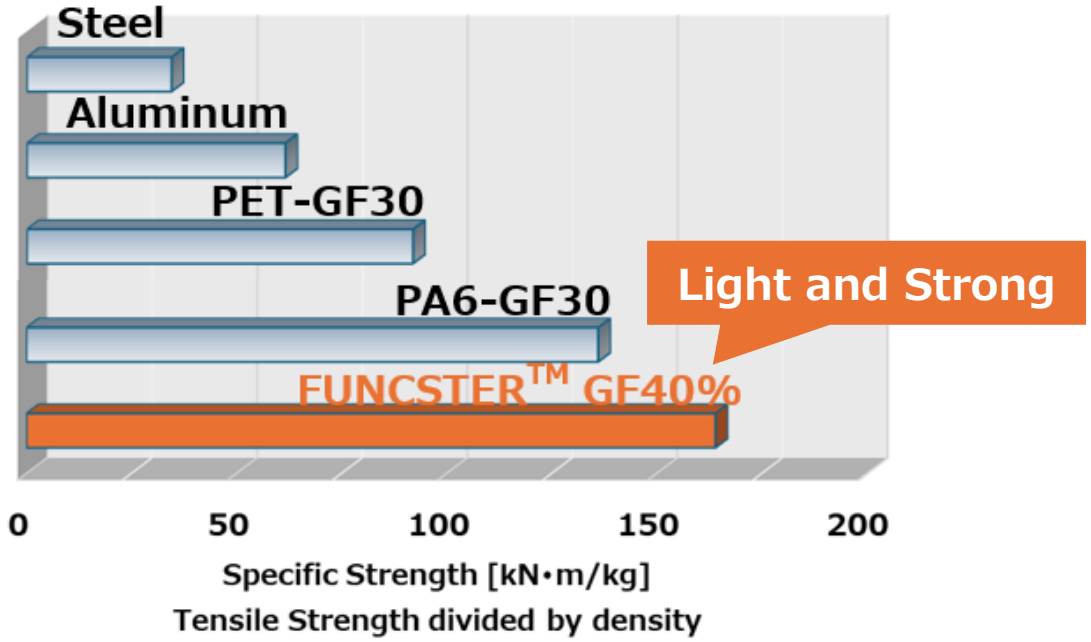
X-ray photo (negative) of 150 mm φ x 2.5 mmt plate

Environmentally Friendly

Japan Polypropylene

Reduction of CO2 emissions from automobiles, extension of cruising range due to conversion to EVs, etc. We develop and propose "lightweight and highly rigid materials" that can contribute to environmental friendliness.

Low density

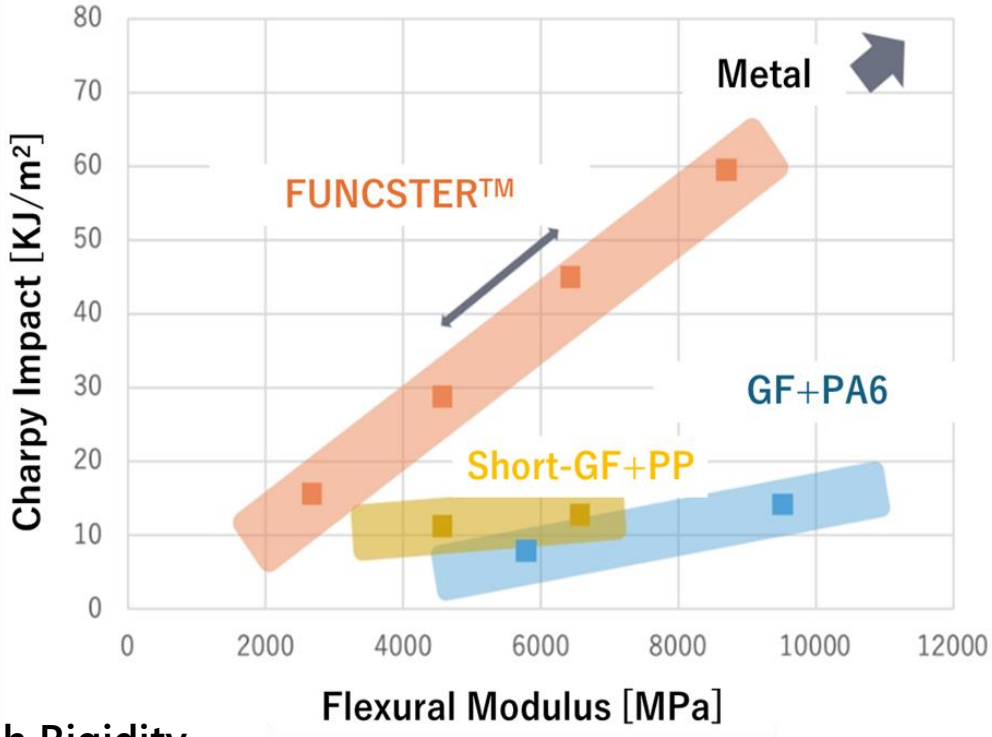


High appearance Back Door (No painting)

Physical properties of FUNCSTER™

FUNCSTER™ has lower specific gravity, higher impact strength than other materials

			LR24A* - GF40% -	GF30+PA6 - Dry State -
Specific Gravity	**ISO 1183**	**-**	**1.22**	1.36
Tensile Strength	**ISO 527**	**MPa**	200	180
Flexural Modulus	**ISO 178**	**MPa**	9,200	8,700
Flexural Strength	**ISO 178**	**MPa**	255	250
Charpy Impact (Notched)	**ISO 179/1eA**	**kJ/m²**	**59**	15
HDT (1.8 MPa)	**ISO 75**	**ºC**	164	210
Spiral flow Length (2.5mm, 60MPa)	**JPP Method**	**cm**	**75** at 230℃	38 at 290℃



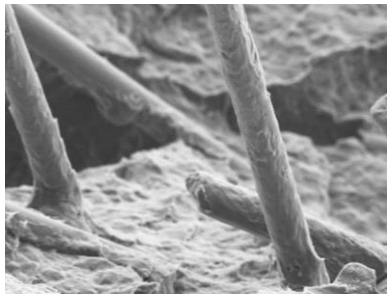
Feature(1) High Impact Strength

Test piece after Puncture test

Residual GF after incineration

Intertwined LGF shows large expansion by the effect of springback.

Feature(2) High Rigidity



Funcster ™ has excellent interfacial properties between PP and GF

Physical properties of FUNCSTER™

Japan Polypropylene

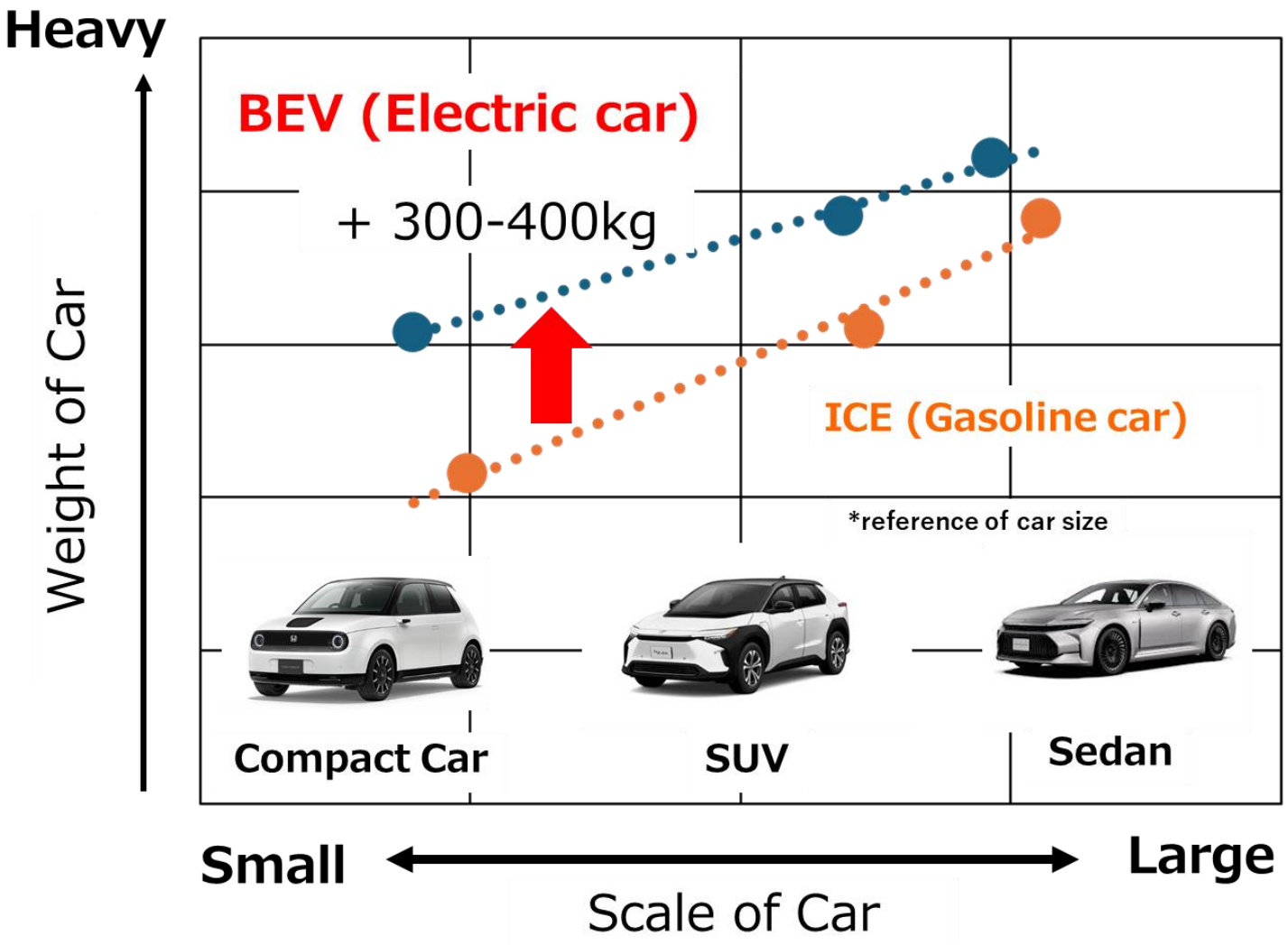
Wide range of FUNCSTER™ grades will be able to meet your needs!

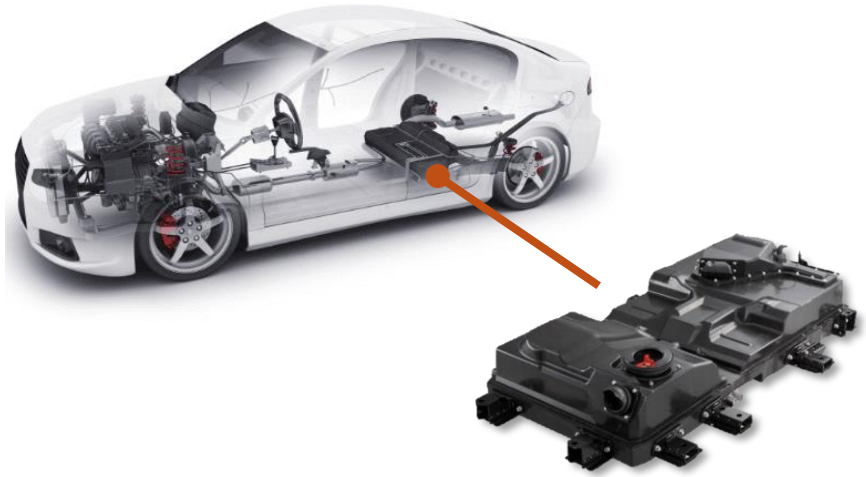
				LR21V - GF10% -	LR22W - GF20% -	LR23C - GF30% -	LR24A - GF40% -	LR25Z - GF50% -	LR26Y - GF57% -
Specific Gravity	ISO 1183	-	-	0.96	1.04	1.12	1.22	1.33	1.43
Tensile Strength	ISO 527	23℃	MPa	80	125	160	200	210	205
Flexural Modulus	ISO 178	23℃	MPa	3,500	5,300	7,300	9,200	12,200	14,700
Flexural Strength	ISO 178	23℃	MPa	115	170	220	255	290	300
Charpy Impact (Notched)	ISO 179/1eA	23℃	kJ/m^2	11	27	38	59	65	65
HDT (1.8 MPa)	ISO 75	-	ºC	154	158	160	164	164	164

＊ Injection Machine with Low Shear Screw
＊ JPP Grade

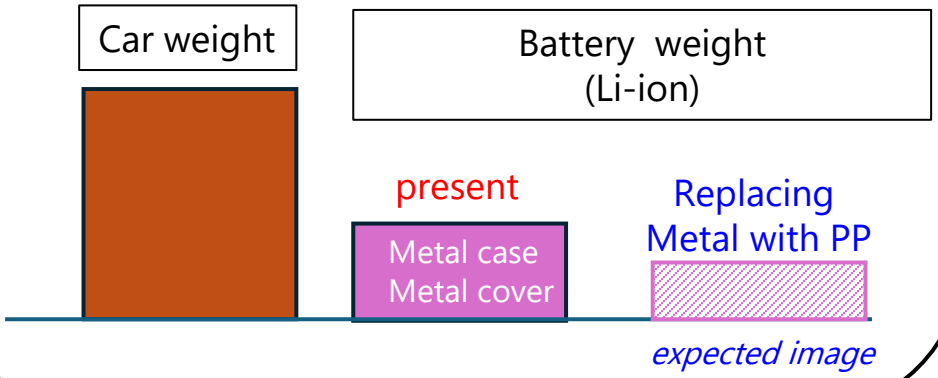
Contents

Background





Battery case is heavy…



Lightweighting (metal substitution etc.) is required to extend the traveling distance of electric cars.

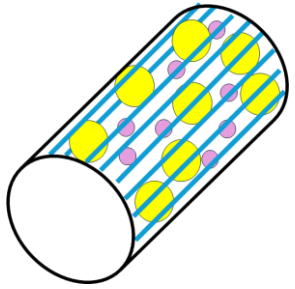
Development process

START → Study → Evaluation → GOAL

Material

Molding

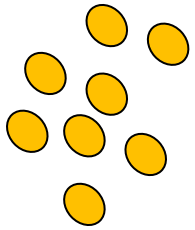
Study



FUNCSTER™

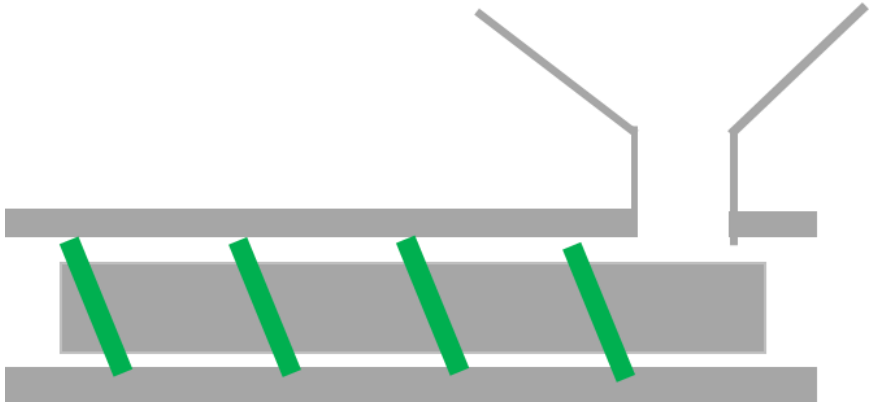
- GF concentration
- PP (type, MFR, …)
- Additives etc…

- Machine type
- Molding temp. etc…

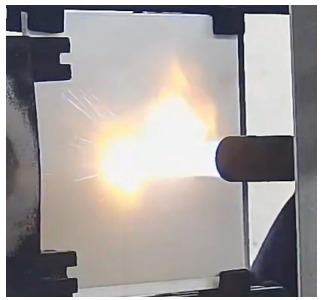


Flame Retardant

- FR concentration
- FR type etc…



Evaluation



TaG TEST

BETR TEST

Key point!

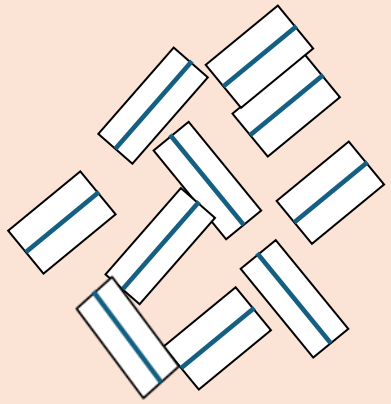
- Residual Fiber length
- A certain Flame Retardant

Recipe of HFR-FS

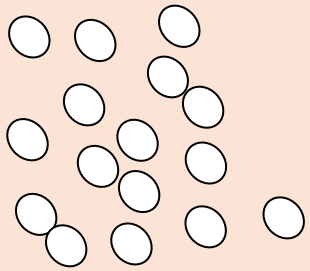
Japan Polypropylene

HFR-FS

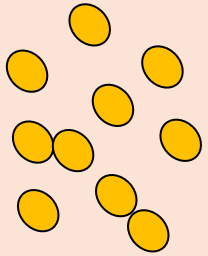
*material combination examples



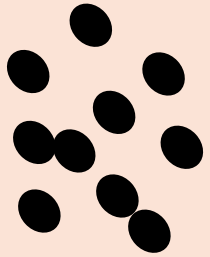
FUNCSTER™



Dilution PP



Flame Retardant MB



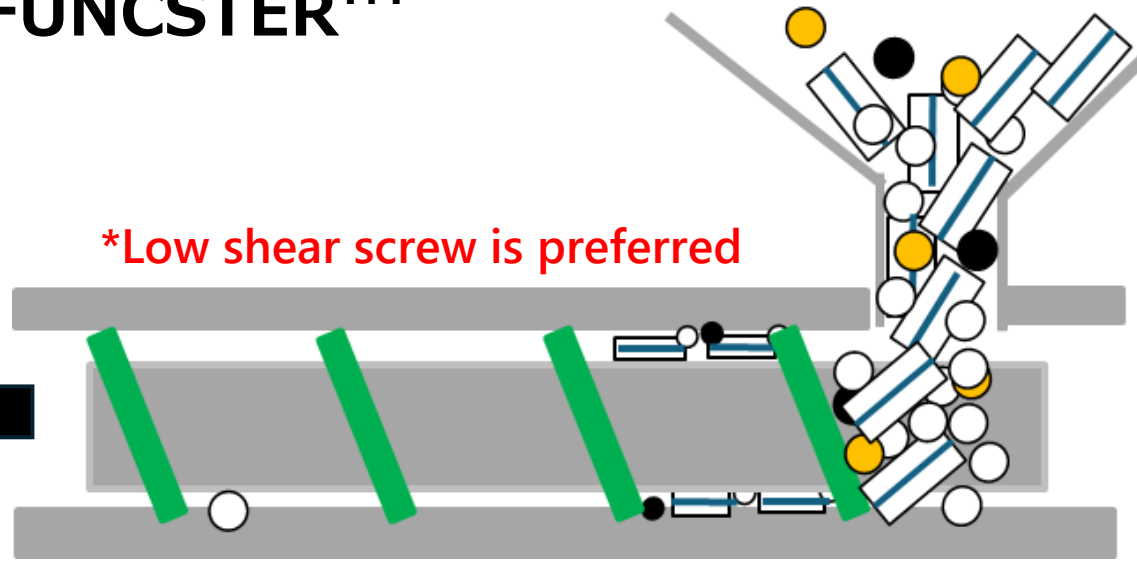
Pigment MB

Mix!

HFR-FS・・・High Flame Retardant FUNCSTER™

Battery Case

*Low shear screw is preferred



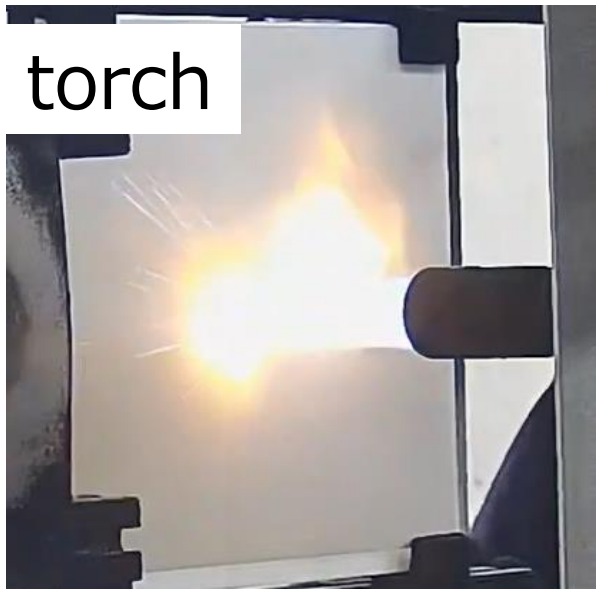
Evaluation① TaG Test

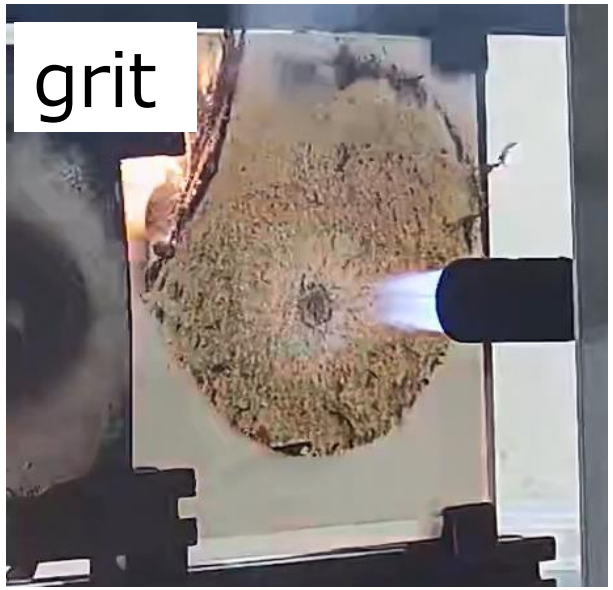
What is TaG TEST? → Torch and Grit Test (UL2596)

Torch : Exposure to a 1200°C flame (15 seconds)

Grit : High-pressure injection of alumina powder (5 seconds)

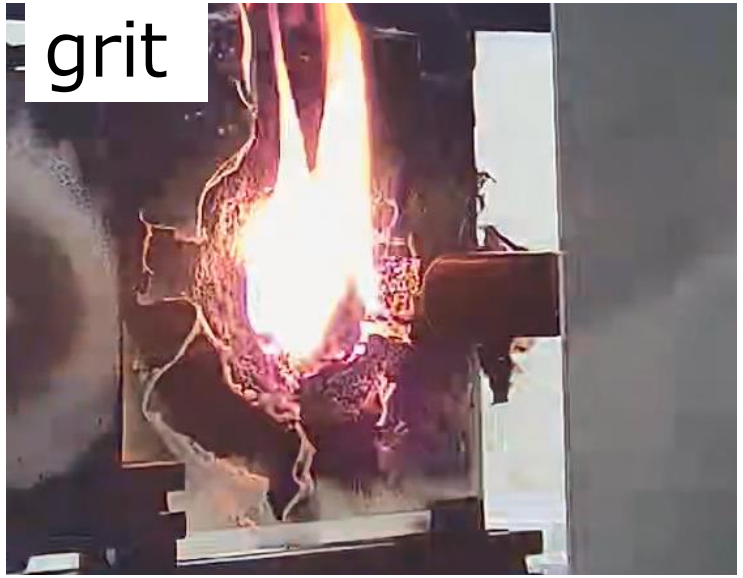
1cycle





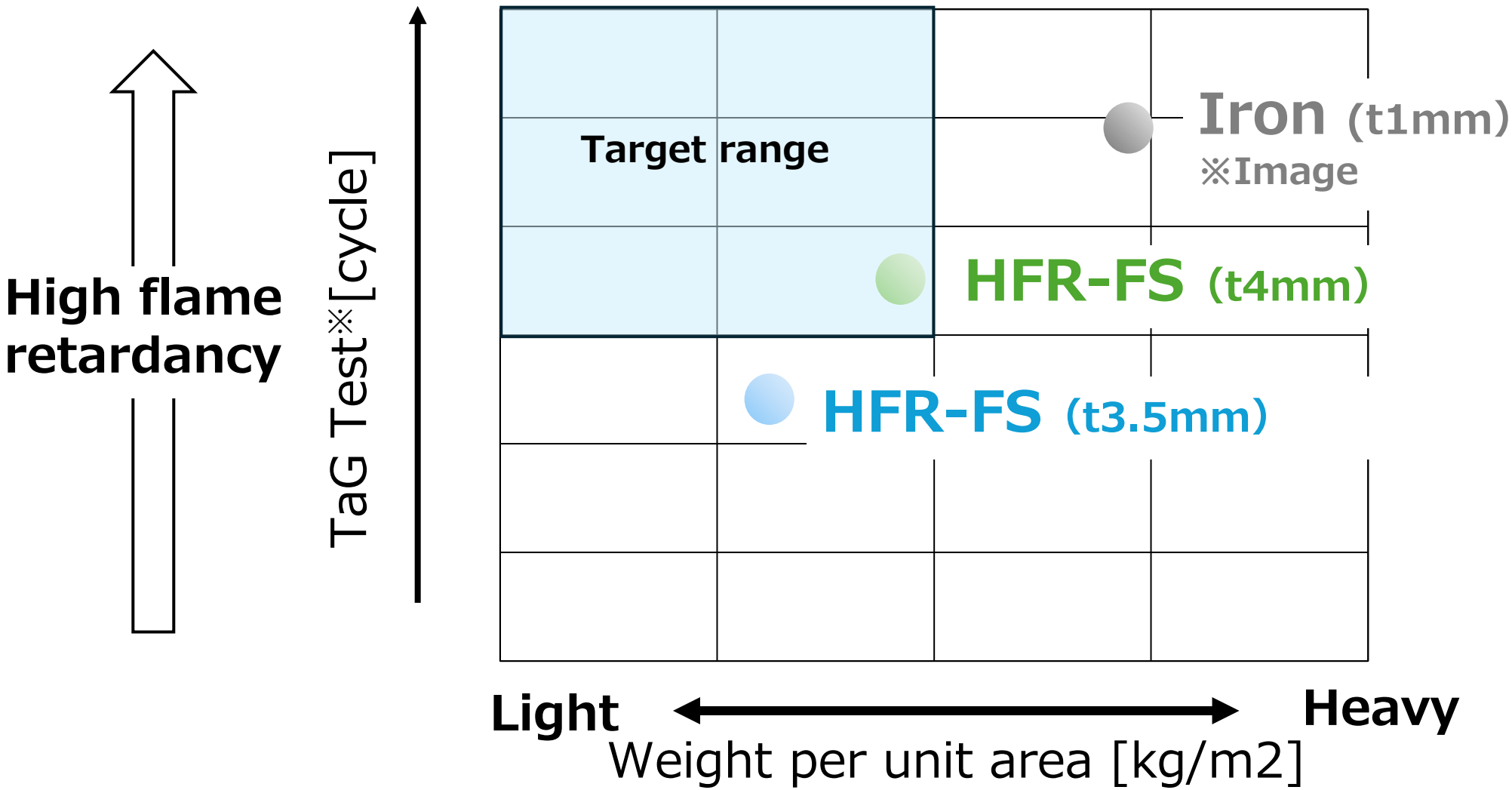
? cycle

…



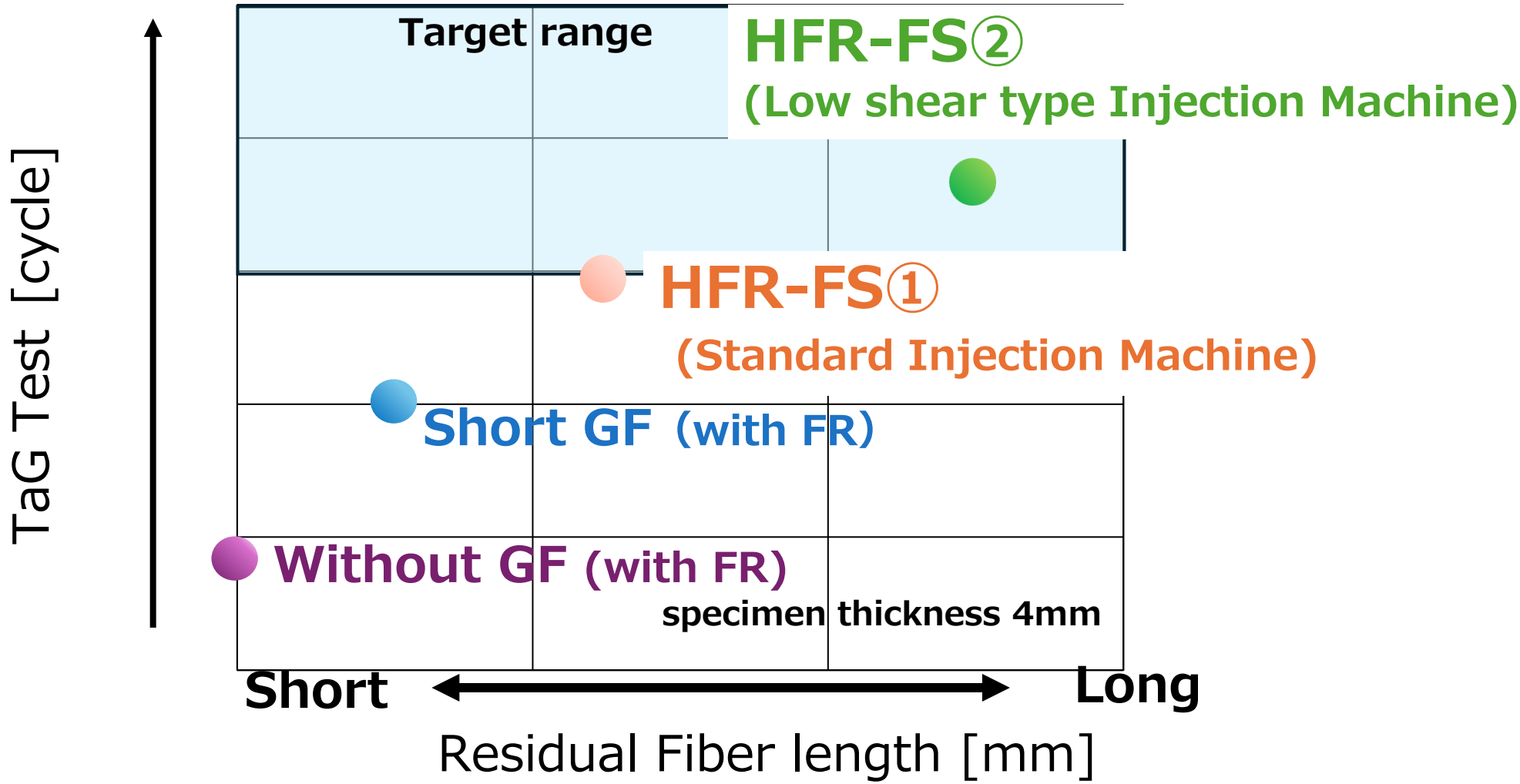
The number of cycles is counted until the flame penetrates the back of the test piece

TaG test & Material weight



To achieve high flame retardancy even if the thickness increases, HFR-FS shows lightweight .

TaG test & residual fiber length

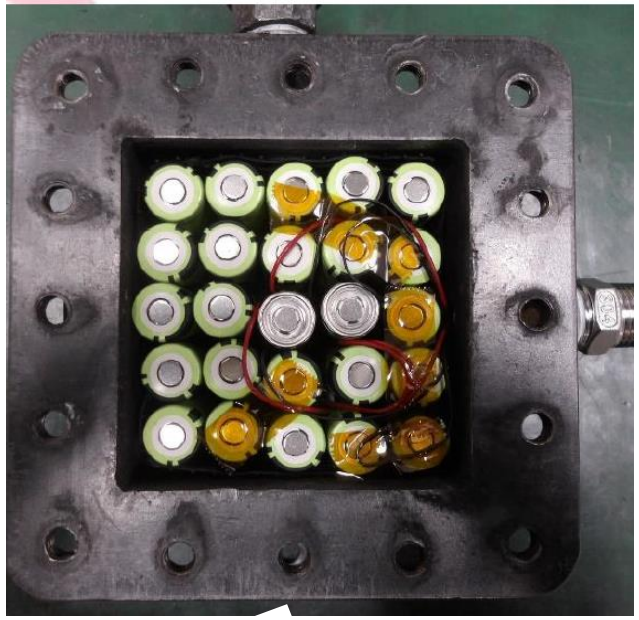


Flame retardancy are improved by remaining fiber length in the molded product longer

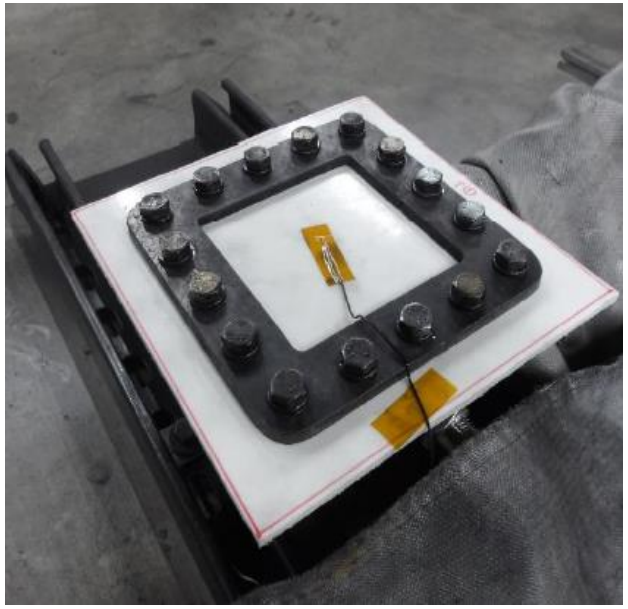
Evaluation② BETR TEST

Japan Polypropylene

What is BETR TEST? → Battery Enclosure Thermal Runaway



Test Plaque set



Thermal runaway

Testing to see if a small battery can go into thermal runaway and prevent the spread of flames to the outside (topside)

Results of BETR TEST

Japan Polypropylene

Without penetration or Browing away of test plaque, it must be endured 3 times

（Developed material, flat Plate t4mm ）

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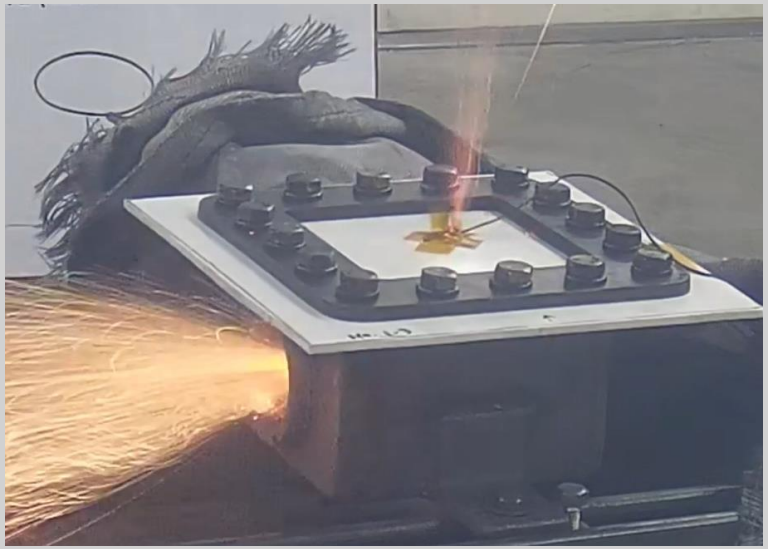
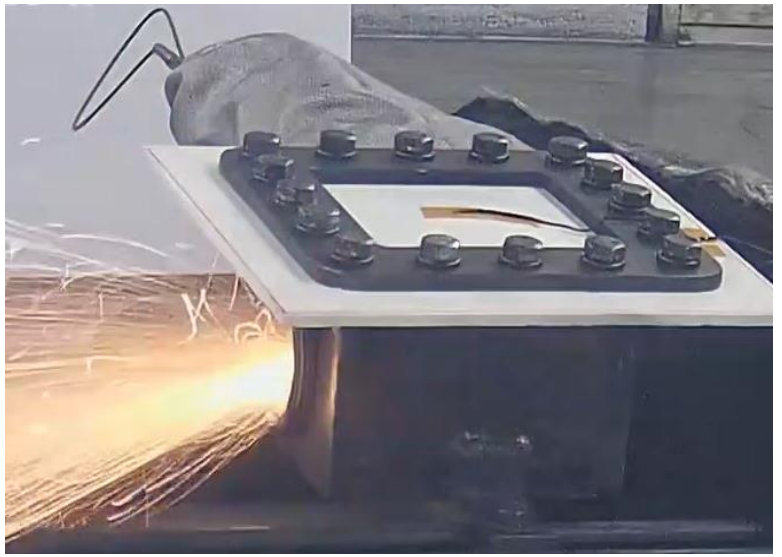


Penetration

Browing away

OK



Successful development of impenetrable materials !

Contents

Summary

- **FUNCSTER™ is high performance polypropylene and has many benefits.**
- **We succeeded in developing the materials that are not penetrated by BETR Test.**
- **Our material will contribute to weight reduction due to lower specific gravity than metal.**