



**STRUCTURAL • ELASTOMERS • WEAR • COLOR
CONDUCTIVE • FLAME RETARDANT • FILM/SHEET**

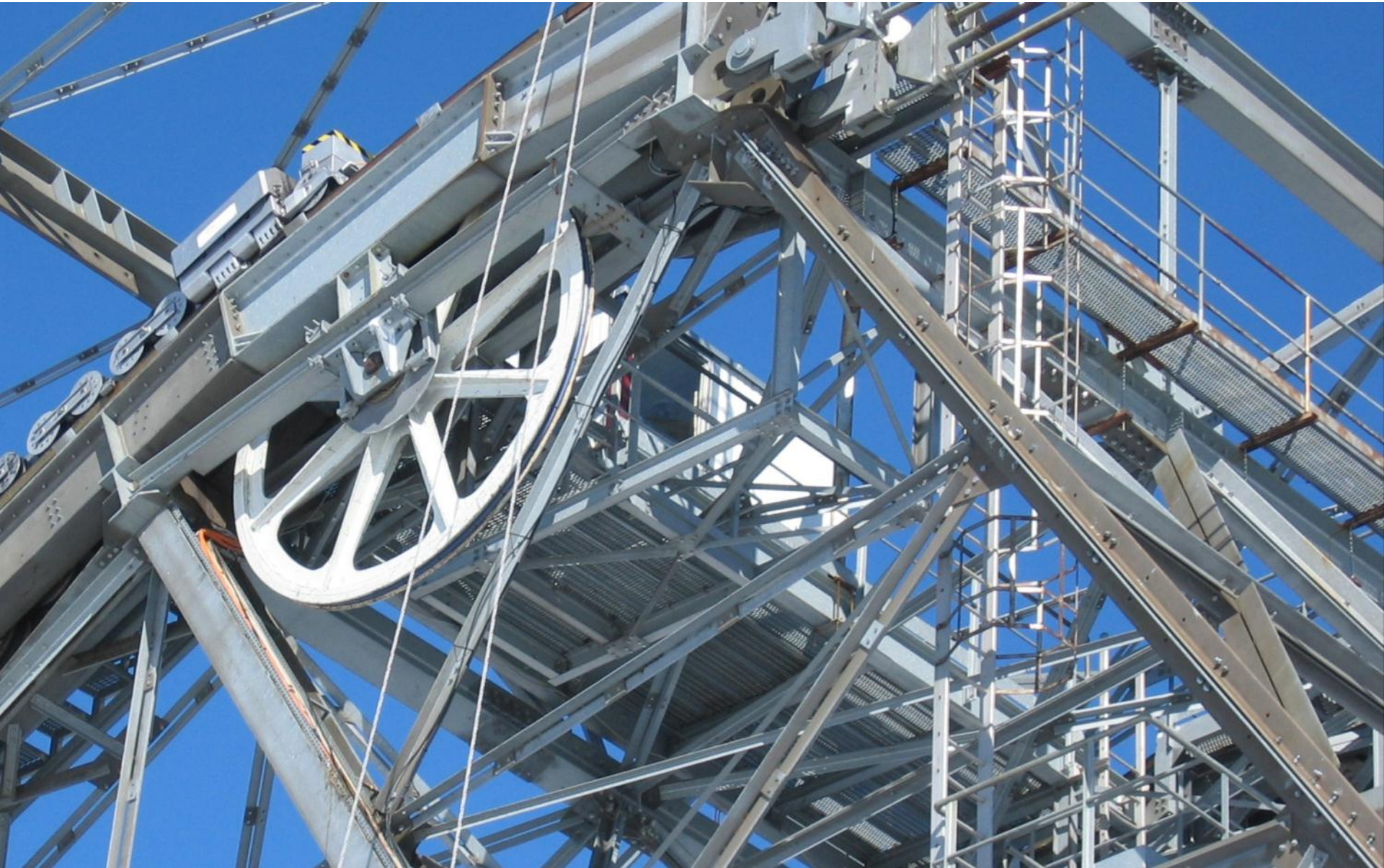
Structural and Long Fiber Composites **结构增强与长纤复合材料**

Karl Hoppe



Strength 强度

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS





Stiffness 刚性

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS





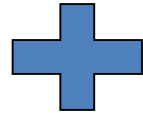
Impact 冲击强度

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS





Resin



Change in
Properties

树脂

添加剂

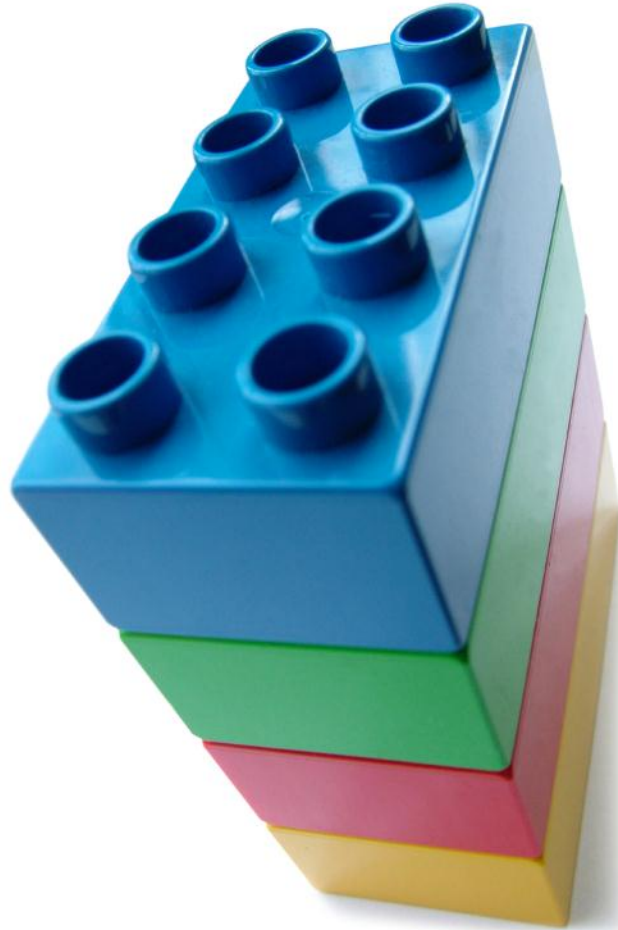
性能改善

Structural Additives: Foundation

结构添加剂：构成基础



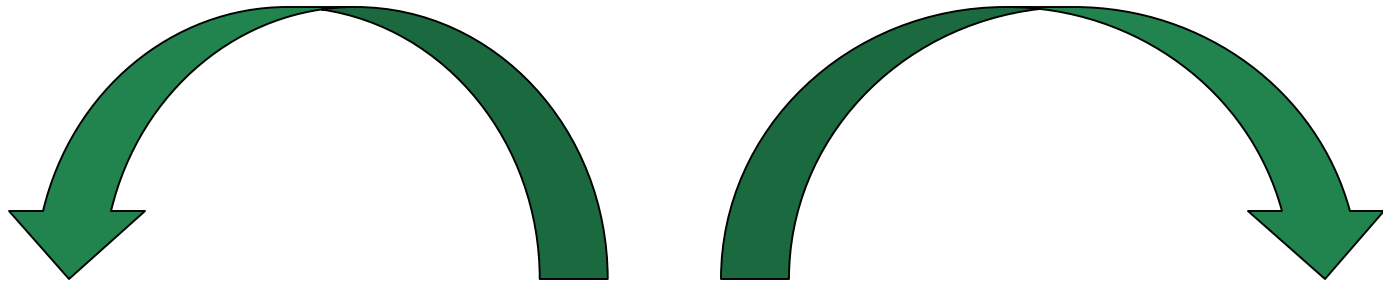
YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS





In this Presentation 这里会介绍...

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS



Modifiers

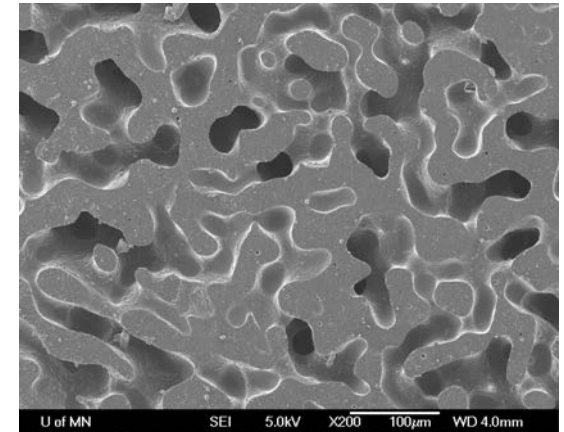
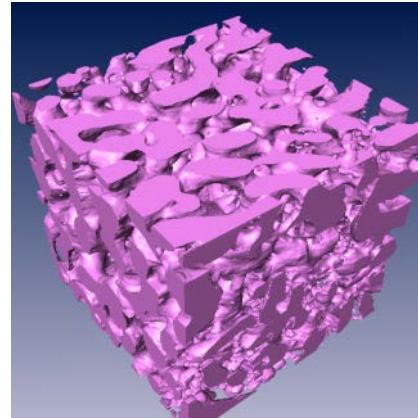
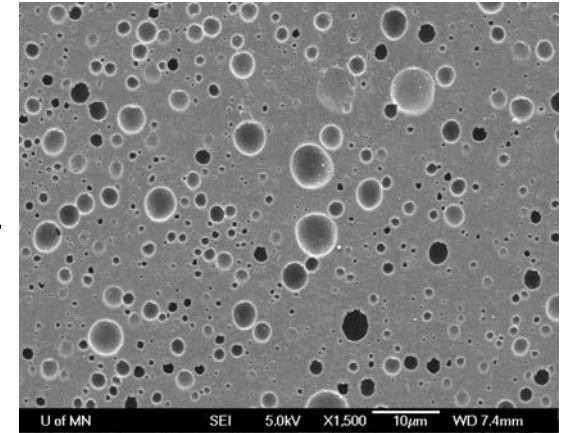
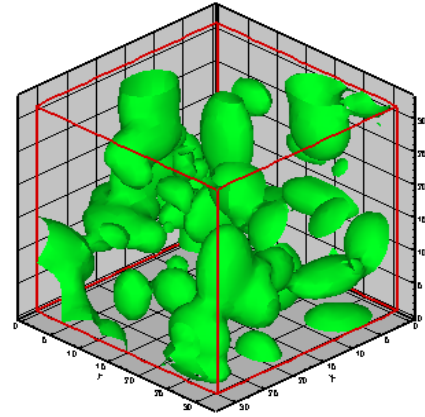
改性剂



Fillers

填料

Polymer Blends Impact Modifiers 聚合物与冲击改性剂 共混

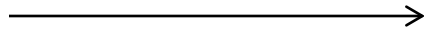




Polymer Blends 聚合物共混改性

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

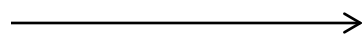
PC/ABS



ABS brings ABS提供

- Improved flow 流动性
- Chemical resistance 耐化学性
- Cost reduction 节省成本

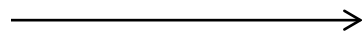
Nylon/PP



PP brings PP提供

- Improved flow 流动性
- Chemical resistance 耐化学性
- Cost reduction 节省成本

PBT/PC



PC brings PC提供

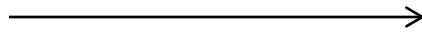
- Improved toughness 韧性
- Dimensional stability 尺寸稳定性



Polymer Blends 聚合物共混改性

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

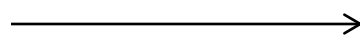
PC/ABS



PC brings PC提供

- Toughness 韧性
- Strength 强度

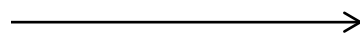
Nylon/PP



Nylon brings 尼龙提供

- Strength 强度
- Stiffness 刚性

PBT/PC



PBT brings PBT提供

- Chemical resistance 耐化学性
- Improved flow 流动性



Polymer Blends 聚合物共混改性

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

	PC	PC/ABS (RTP 2500 A)	ABS
Specific Gravity 比重	1.19	1.15	1.05
Tensile Strength 拉伸强度	59 MPa	59 Mpa	45 MPa
Notched Izod Impact 悬臂梁缺口 冲击强度	850 J/m	740 J/m	250 J/m

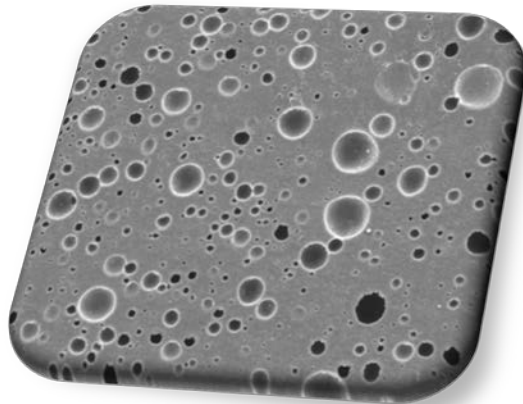
Hearing Tester 听力测试仪

“We wanted the benefits and flexibility of ABS, combined with the strength of polycarbonate.” 我们想要得到ABS的优点和延展性，同时得到PC的高强度。

-Steve Iseberg
Etymotic Research



Polycarbonate/ABS
PC/ABS

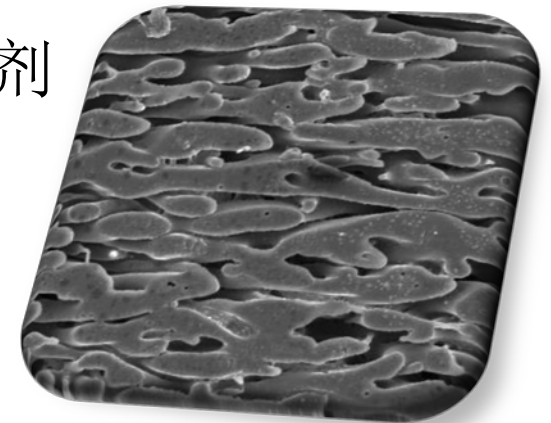


Impact properties

冲击强度

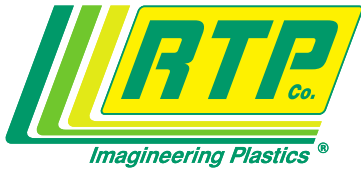
Impact Modifiers

冲击改性剂



Strength 强度

Stiffness 刚性



Impact Modifiers 冲击改性剂

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

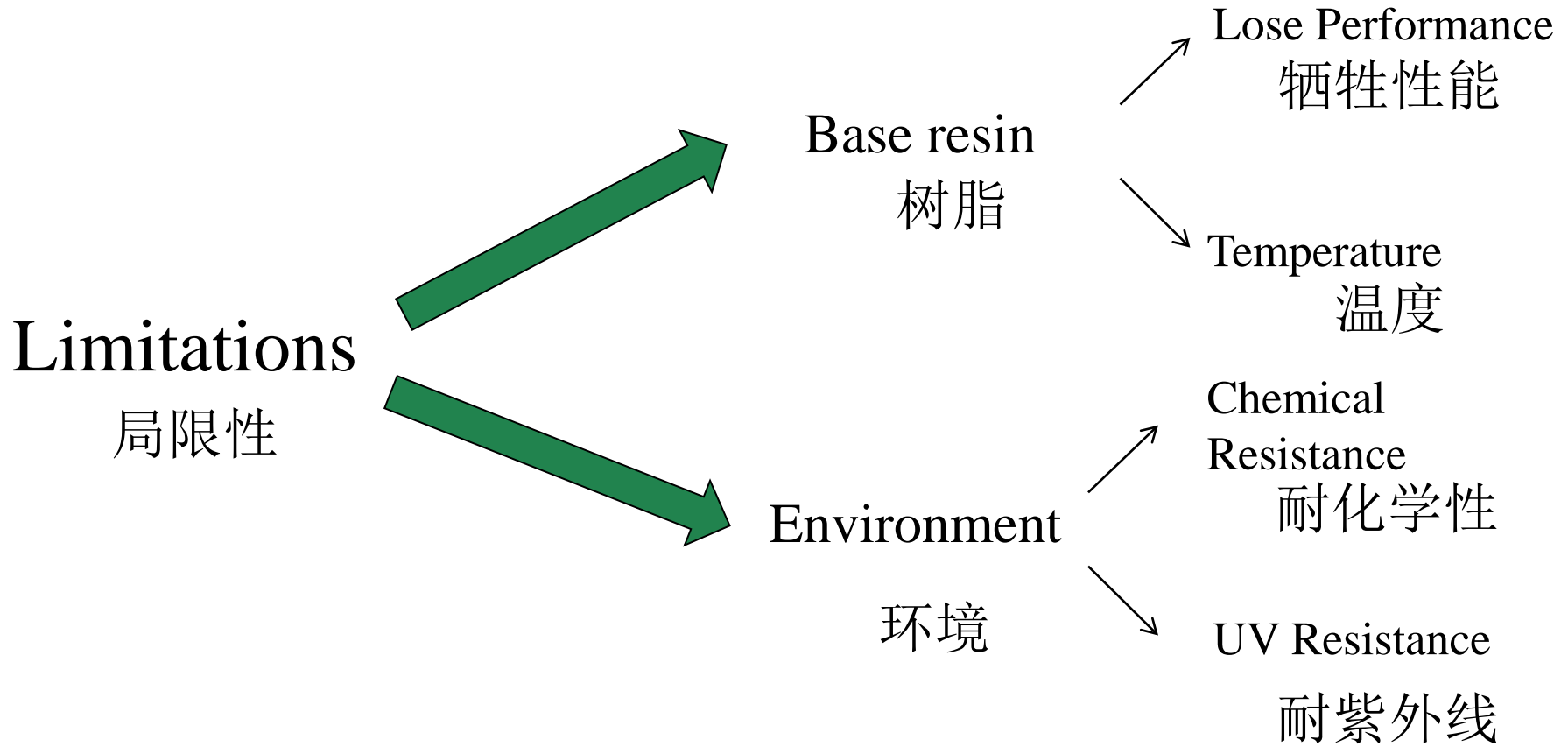
	PA 6/6	Impact Modified PA 6/6
Specific Gravity 比重	1.14	1.08
Notched Izod Impact 悬臂梁缺口冲击强度	55 J/m	900 J/m
Tensile Strength 拉伸强度	80 J/m	45 J/m
Flexural Modulus 弯曲模量	2.8 GPa	1.8 GPa

Wireless Workstation 无线 工作站

- For external, non FR parts
外部件，无需阻燃
 - Impact 冲击强度
 - Abrasion 耐磨
 - Durability 耐久



Impact Modified PA 6/6
冲击改性PA66

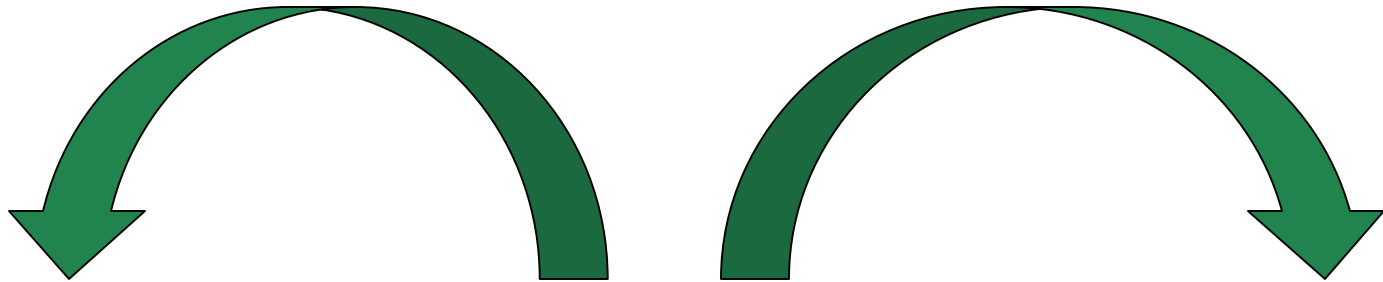


Stabilizers 稳定剂

Protect from:

UV 耐UV

Heat aging 耐热



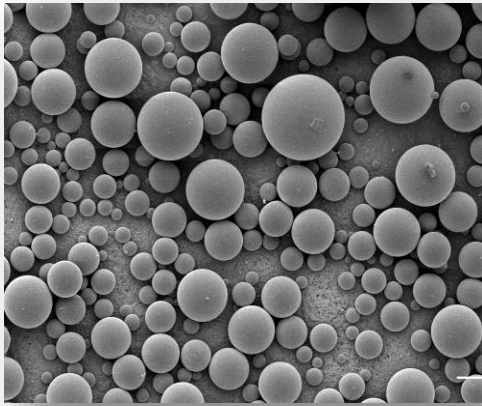
Modifiers

改性剂



Fillers

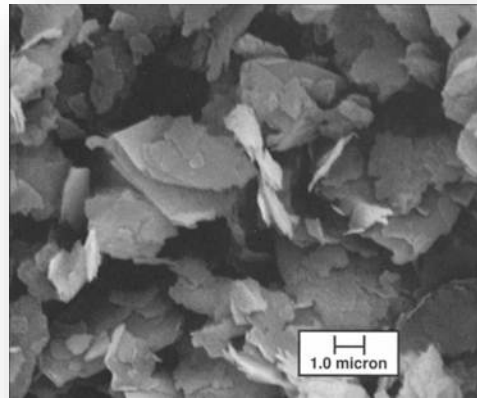
填料



Beads (Glass)

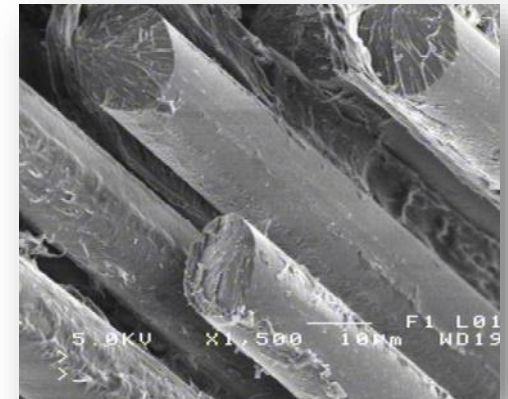
(photo: Potters, Inc.)

微珠（玻璃）



Minerals (Talc)

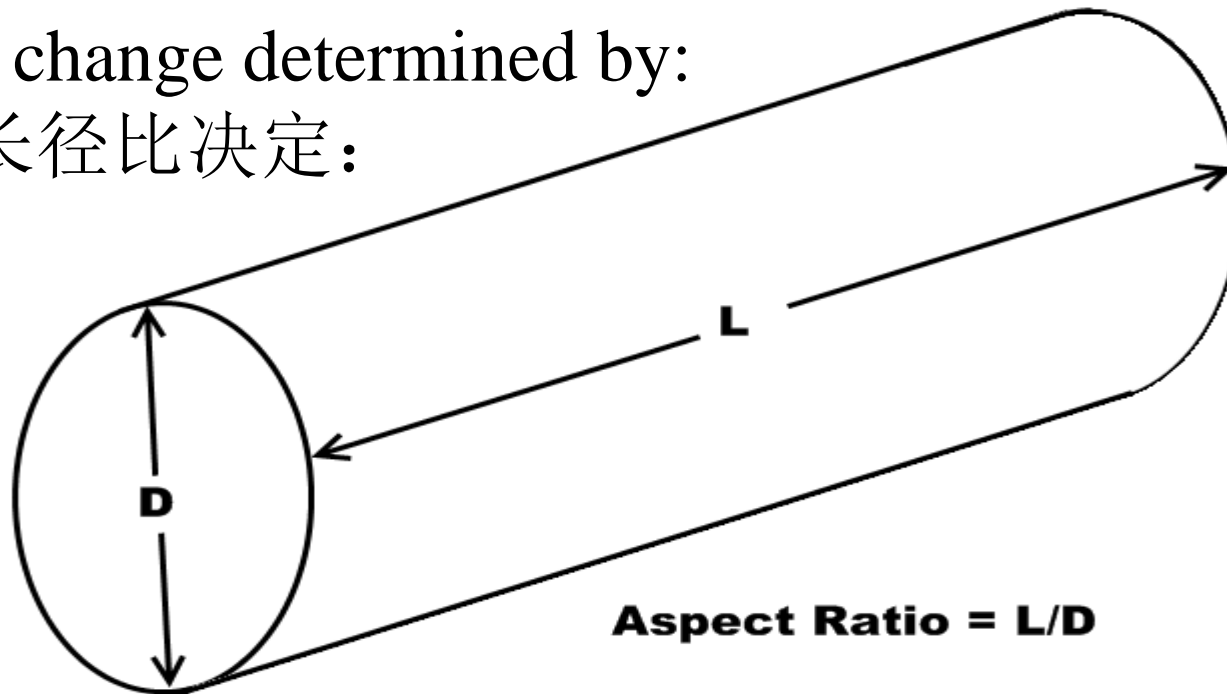
矿物（滑石）



Fibers (Glass)

纤维（玻璃）

Property change determined by:
性能由长径比决定:



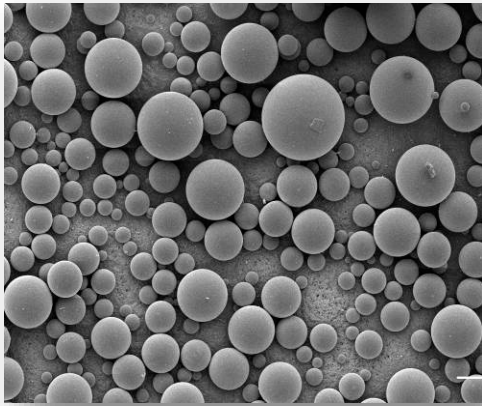
Aspect Ratio

长径比



Reinforcing

增强效果



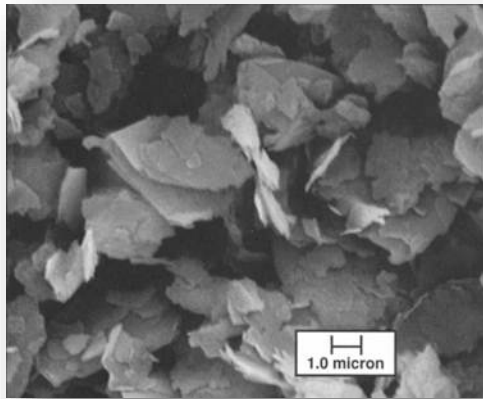
Beads (Glass)

(photo: Potters, Inc.)

玻璃微珠

Aspect Ratio = 1

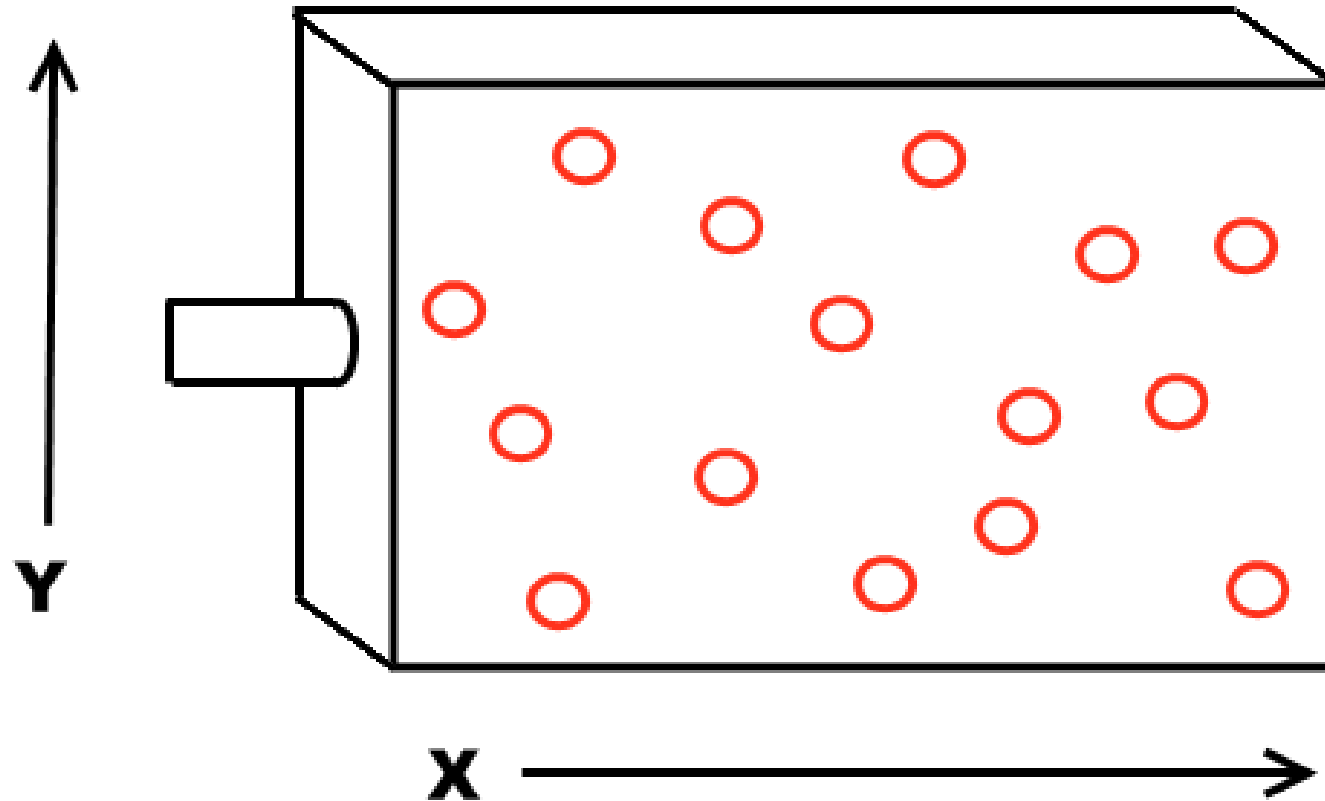
	PC	PC + 10% Glass Beads	PC + 30% Glass Beads
Specific Gravity 比重	1.19	1.27	1.42
Tensile Strength 拉伸强度	59 MPa	55 MPa	48 MPa
Notched Izod Impact 悬臂梁缺口冲击强度	850 J/m	100 J/m	80 J/m
Flexural Modulus 弯曲模量	2.4 GPa	2.6 GPa	3.4 GPa



Minerals (Talc)
滑石粉

Aspect Ratio = 2-50

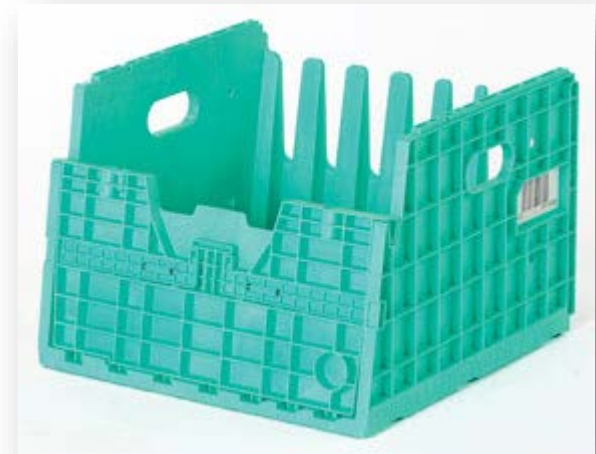
	PP	PP + 20% Talc	PP + 40% Talc
Specific Gravity 比重	0.91	1.05	1.25
Tensile Strength 拉伸强度	32 MPa	32 MPa	30 MPa
Notched Izod Impact 悬臂梁缺口冲击强度	47 J/m	45 J/m	34 J/m
Flexural Modulus 弯曲模量	1.5 GPa	2.5 GPa	3.8 GPa



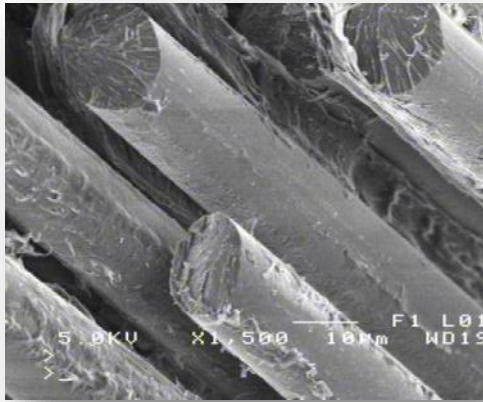
Reusable Plastic Handling Container 可重复使用塑料容器

“Our durable plastic induction trays are designed and injection molded with very tight tolerances ... and they need to maintain dimensional stability through many, many uses on a fast-moving system around the clock.” 我们的耐用塑料感应托盘被设计和成型的公差非常小...他们需要在快速移动的系统连续不断的使用过许多次之后还能维持尺寸的稳定性

-Bill McMahon
Orbis



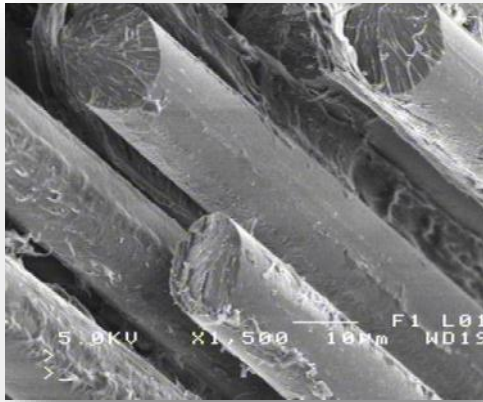
Mineral filled Polypropylene
矿粉填充PP



Fibers (Glass)
玻璃纤维

Aspect Ratio = 50-250

	PC	PC + 30% Glass Beads	PC + 30% Glass Fiber
Specific Gravity 比重	1.19	1.42	1.42
Tensile Strength 拉伸强度	59 MPa	48 MPa	124 MPa
Notched Izod Impact 悬臂梁缺口 冲击强度	850 J/m	80 J/m	160 J/m
Flexural Modulus 弯曲模量	2.4 GPa	3.4 GPa	7.6 GPa



Fibers (Glass)
玻璃纤维

Aspect Ratio = 50-250

	PP	PP + 40% Talc	PP+ 40% Glass Fiber
Specific Gravity 比重	0.91	1.25	1.22
Tensile Strength 拉伸强度	32 MPa	30 MPa	85 MPa
Notched Izod Impact 悬臂梁缺口冲击强度	47 J/m	34 J/m	108 J/m
Flexural Modulus 弯曲模量	1.5 GPa	3.8 GPa	6.9 GPa

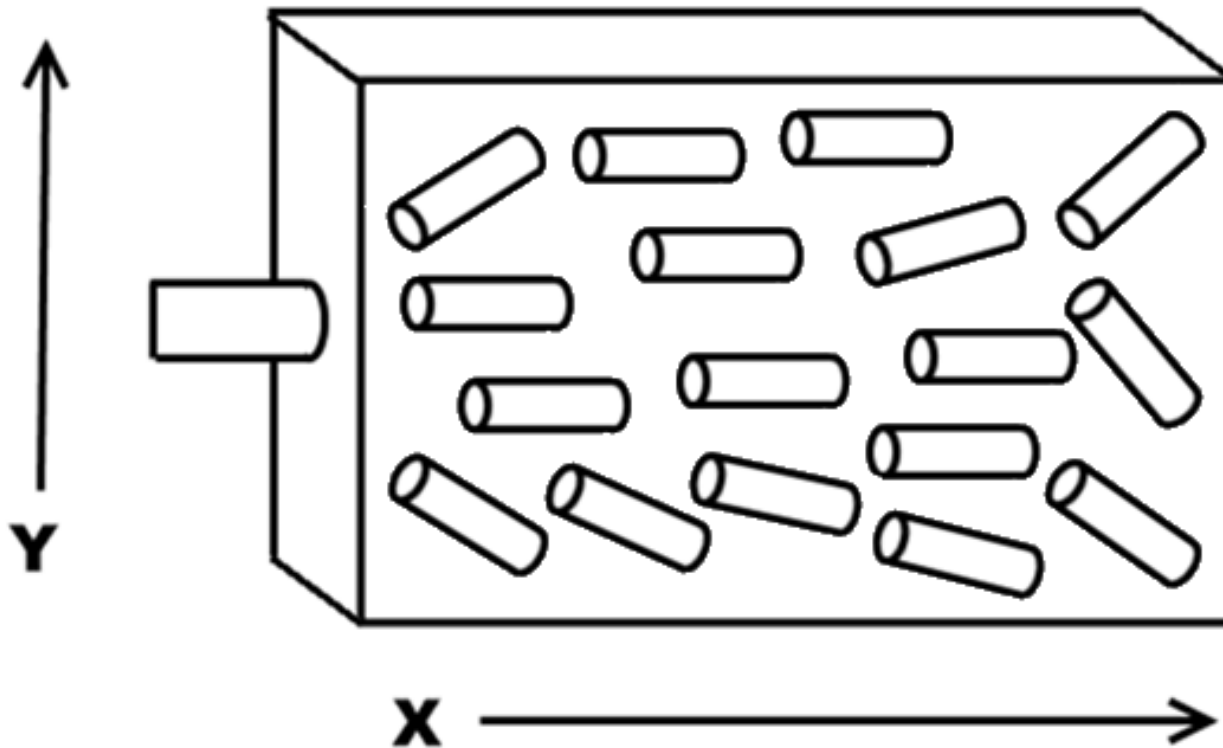
Surgery Drill Guide 外科钻孔导引器

“We were prepared to manufacture metal drill guides, even though we realized that... was a less than elegant solution.” 我们已经准备好制造金属钻孔导引器，尽管我们意识到...这个不是一个精美的设计

-Ryan Belaney
Wright Medical



Glass Fiber Reinforced PC
玻纤增强PC

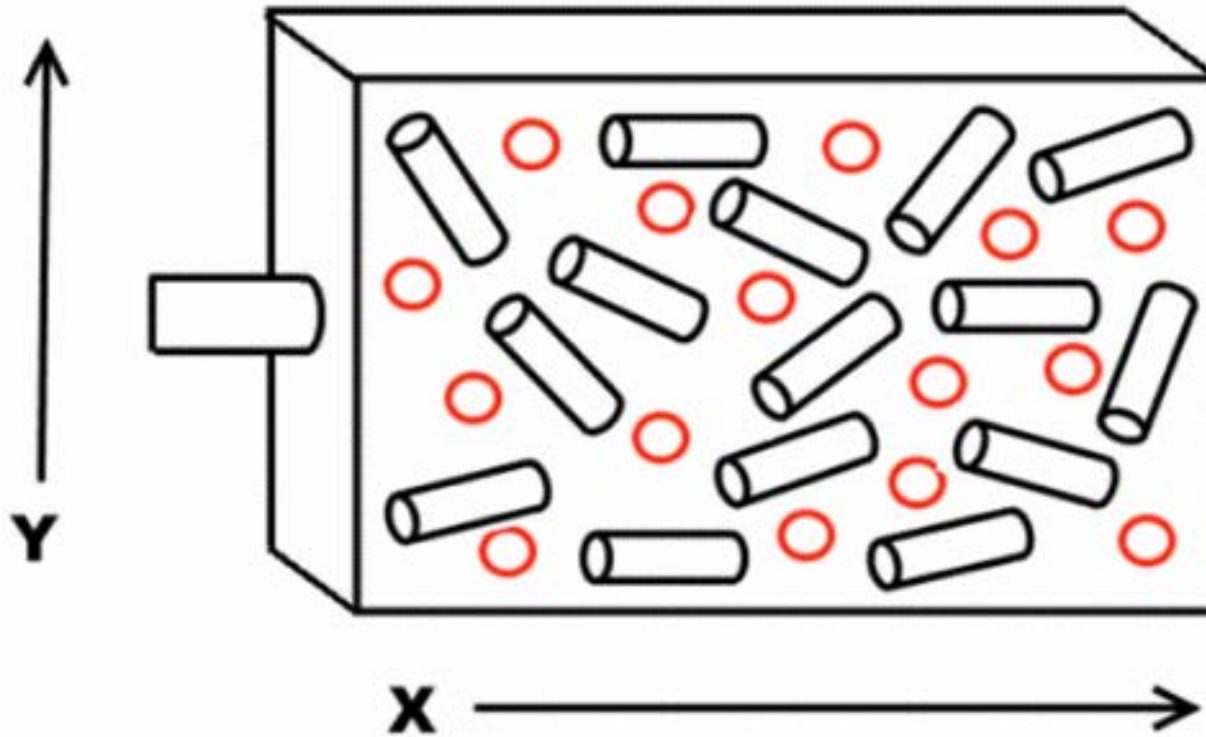


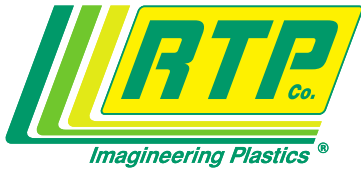


Strength & Warp Control

强度与翘曲控制

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS





High Aspect Ratio 高长径比

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Carbon
Fibers
碳纤维

Aspect Ratio = 50-250

	PEEK	PEEK + 40% Glass Fiber	PEEK + 40% Carbon Fiber
Specific Gravity 比重	1.30	1.61	1.45
Tensile Strength 拉伸强度	93 MPa	186 MPa	265 MPa
Notched Izod Impact 悬臂梁缺口 冲击强度	53 J/m	133 J/m	91 J/m
Flexural Modulus 弯曲模量	3.8 GPa	13.8 GPa	30.3 GPa

Brake Rotor Measuring Probe 刹车盘测量探头

“Pro-Cut was originally going to use cast zinc, machined aluminum or other metals.” Pro-Cut一开始是用浇铸锌，机加工铝或其他金属制造的

-Joel Beaudette
Advantage Plastics

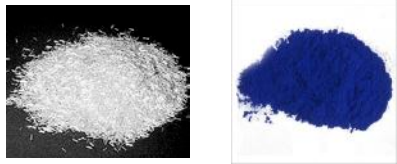


Carbon Fiber Reinforced PPA
碳纤维增强PPA



Compounding Process 加工过程

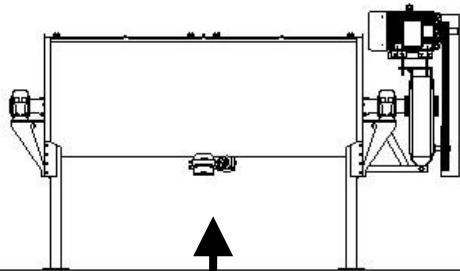
YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS



Raw Materials

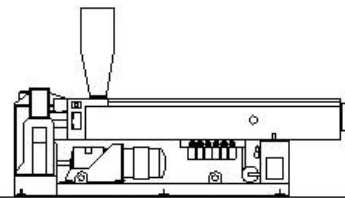


Finished Product



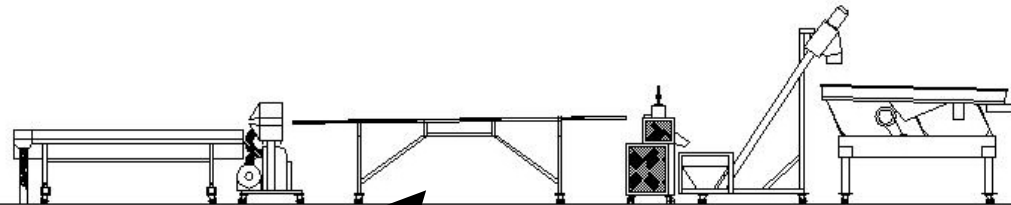
Blender

预混



Extruder

挤出



Cooling

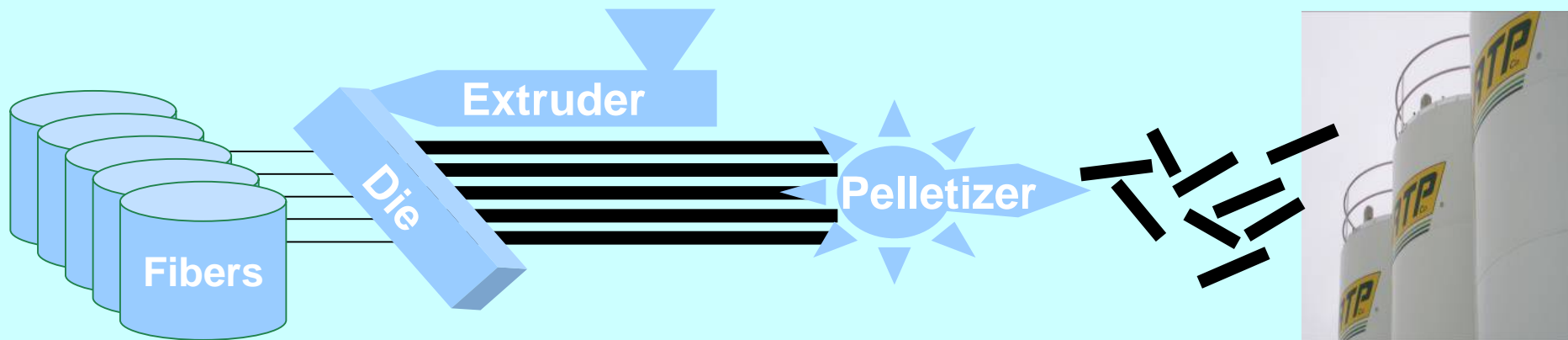
冷却

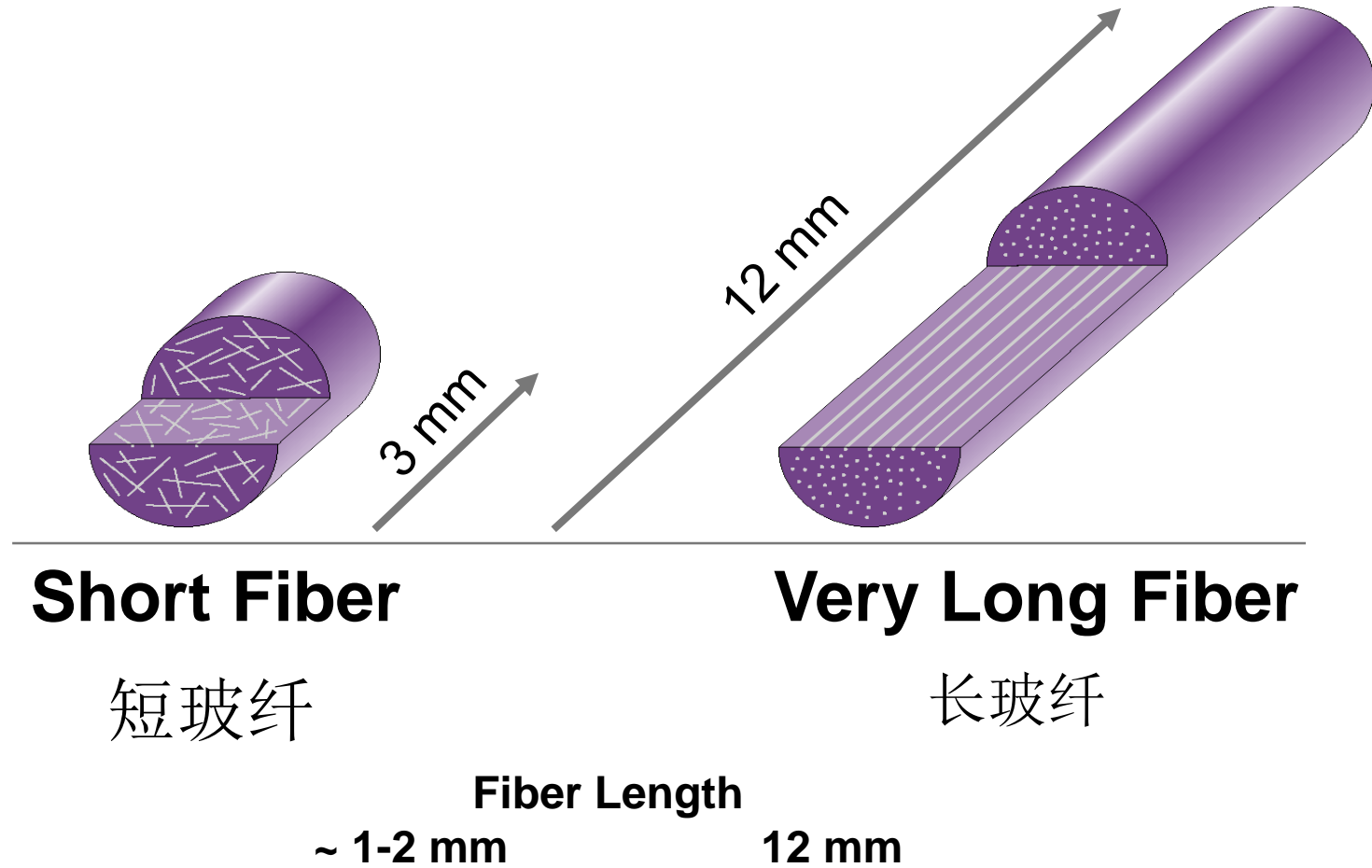
Pelletizer

切粒

Classifier

筛分







Long Glass Fiber
长玻纤

Aspect Ratio = 300+

	PP+ 40% Short Glass	PP + 40% Long Glass
Specific Gravity 比重	1.22	1.22
Tensile Strength 拉伸强度	85 MPa	118 MPa
Notched Izod Impact 悬臂梁缺口 冲击强度	108 J/m	228 J/m
Flexural Modulus 弯曲模量	6.9 GPa	7.7 GPa



**PA 66 + 60% VLF
Seat Belt Tensioner Housings**

安全带张紧装置外壳
60%长玻纤PA66



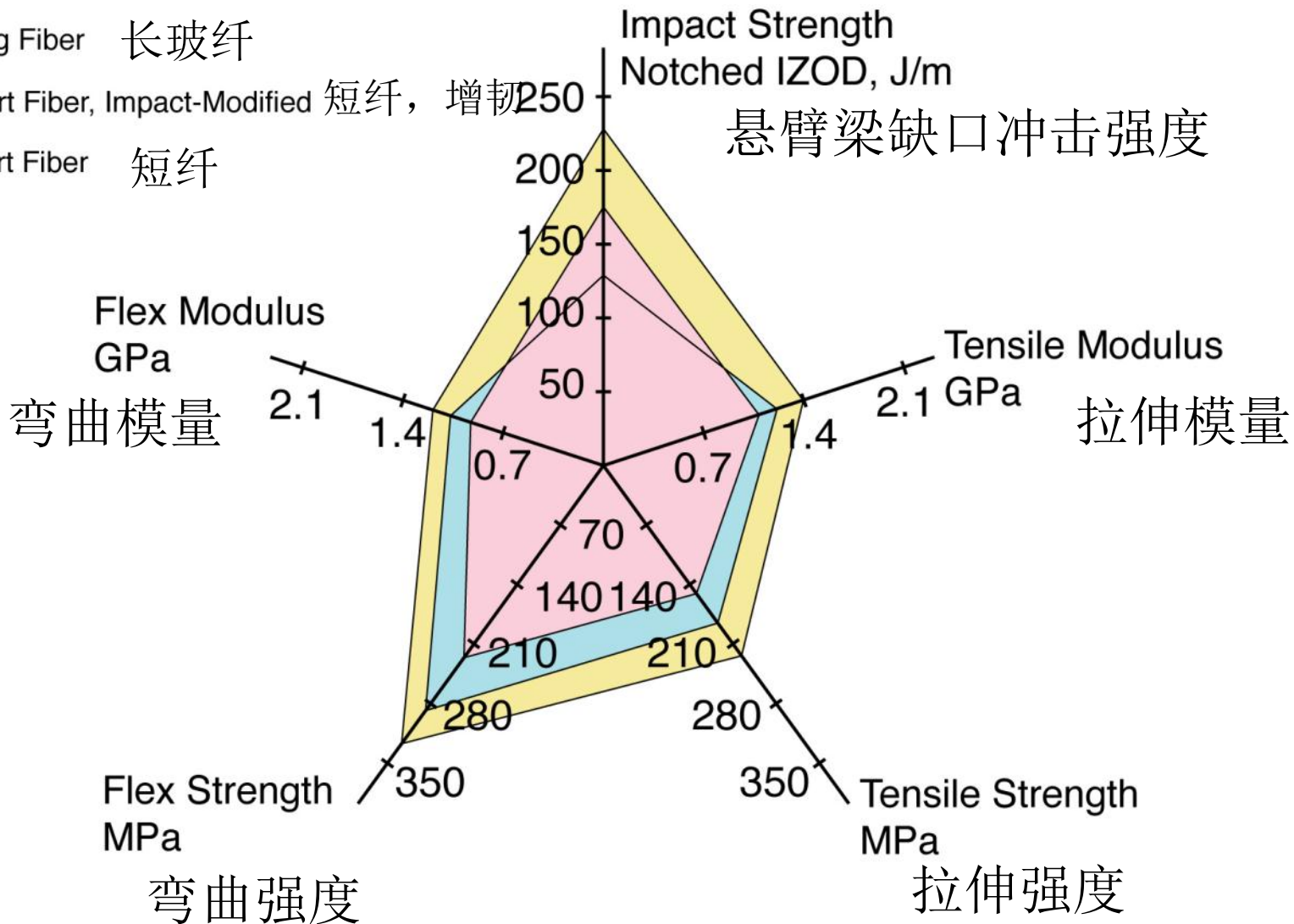


Polyamide 6/6 - 40% Glass Fiber

40%长玻纤尼龙66

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS

- Long Fiber 长玻纤
- Short Fiber, Impact-Modified 短纤, 增韧
- Short Fiber 短纤

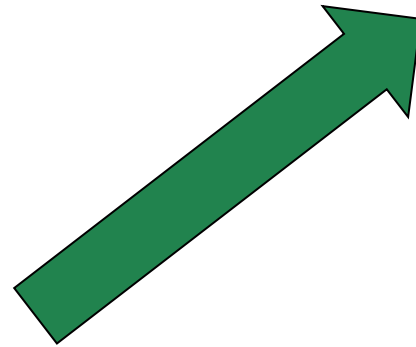




Long Fiber Advantage 长纤的优势

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Higher Impact
高冲击强度



High Stiffness
高刚性

Short
Fiber
Nylon



Increasing load



Very
Long
Fiber
Nylon



Very Long Fiber Advantage

长纤的优势

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS



Safer Impact Mode 更安全的冲击模式

Fastening Tool 扣紧工具

“Faster, lighter tools are what our industry is looking for.” 我们行业需要的是更快更轻的工具

-Mike Repp
Vertex Fasteners



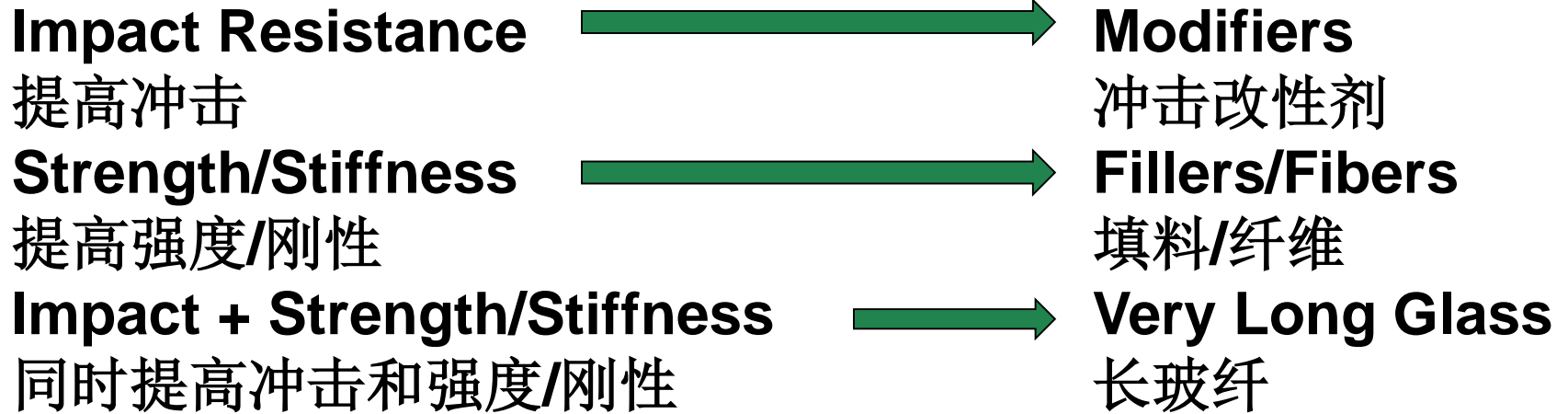
Very Long Glass PA 6/6
长玻纤尼龙66



Structural/VLF Summary

结构增强与长玻纤总结

YOUR GLOBAL COMPOUNDER OF CUSTOM ENGINEERED THERMOPLASTICS



Key to Reinforcement: 增强的关键因素

Aspect Ratio 长径比