



**Breaking the limits of bioplastics – using degradable glass fiber as reinforcement**

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Arctic Biomaterials Oy  
Tomi Kangas, Sales Director

# GENERAL COMPANY INFO

Founded 2014

35 professional persons and over 200 years of biopolymer experience

Manufacturing and R&D sites at Tampere, Finland

New manufacturing site under construction in Asia

HQ



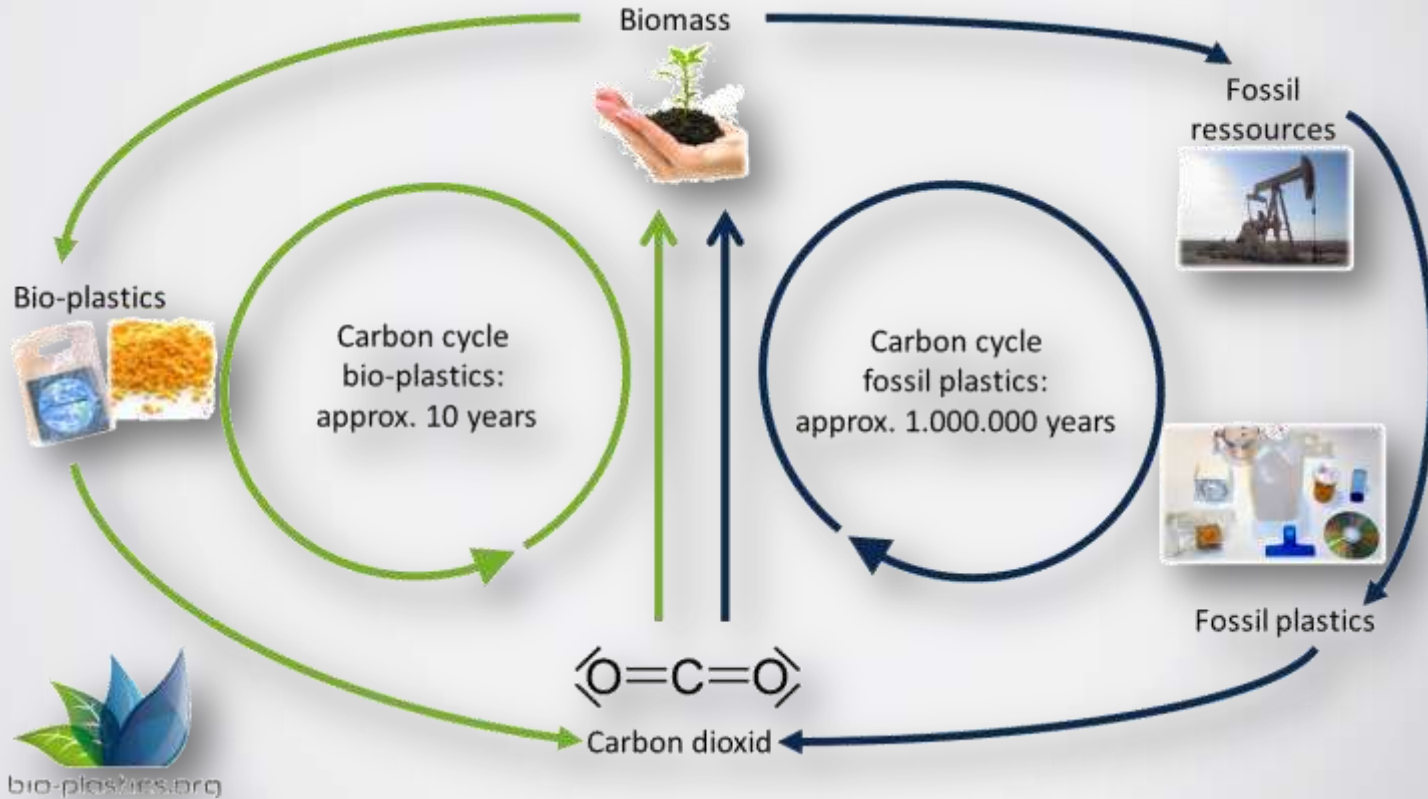
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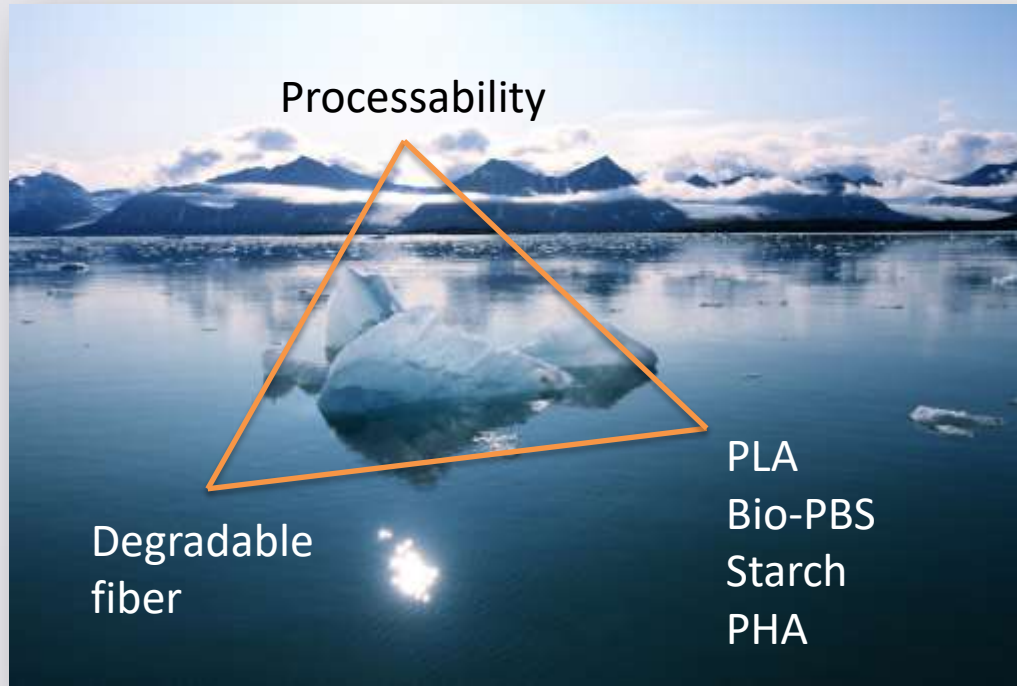
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# GLOBAL CARBON CYCLE



# NEW ERA OF BIODEGRADABLE COMPOSITES



Biodegradable composites which can be processed as current glass fiber reinforced polymers

Polymer matrix chosen from commercially available bioplastics

Reinforcing bioglass fiber that degrades in controlled environment.

# ABM TECHNOLOGY

ABM technical materials can be divided into three platforms:

**Bioglass reinforced composites,**

**Unreinforced compounds**

**Partially bio-based composites** and compounds

Composite technology is **based on proprietary bioglass fiber** and thermoplastic long fiber pultrusion technology (**LFT**)

Matrix polymer is **bio-based and biodegradable** or partially bio-based

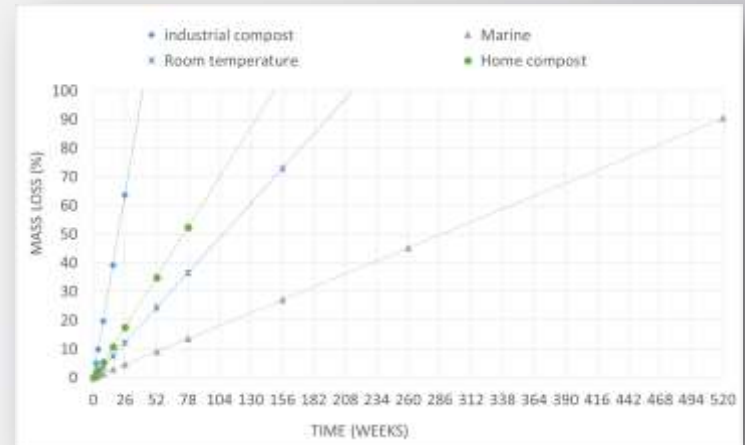
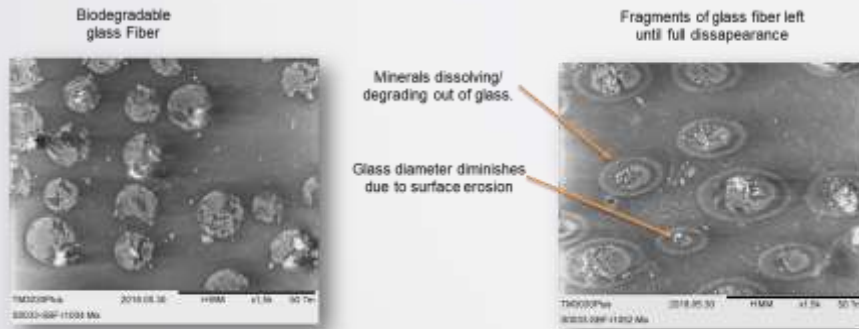
These grades can be processed with **standard injection moulding machines** and tools



# BIODEGRADABLE GLASS FIBER

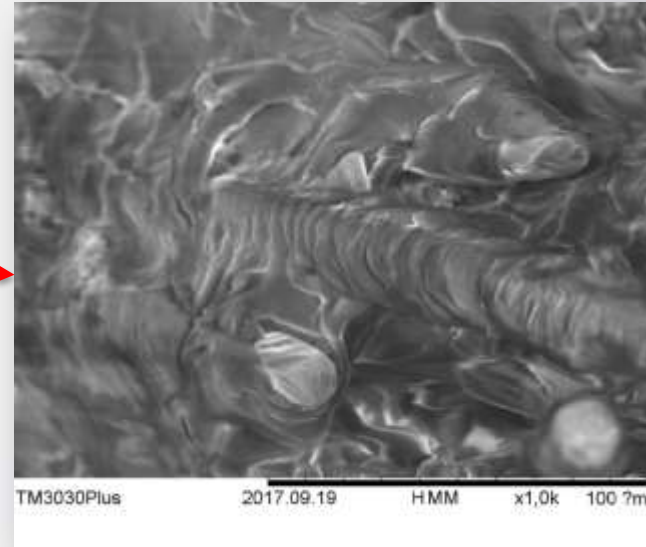
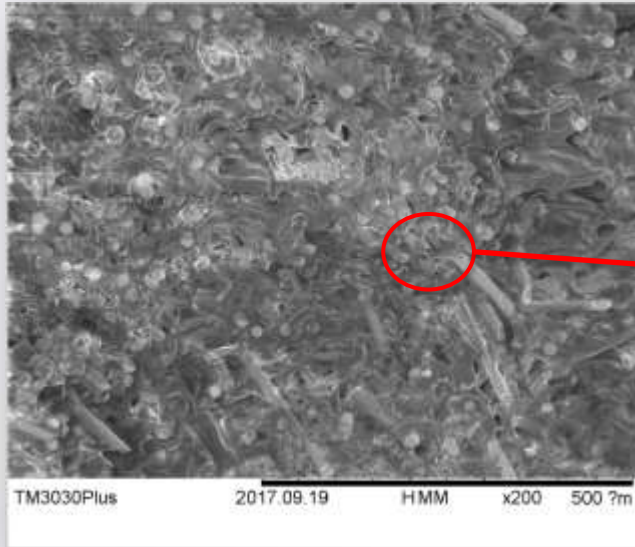
Biodegradable glass fiber has similar properties (TEX1200, tensile strength 2200 -2400 Mpa and Modulus 65-68 Gpa) with technical E- or ECR-glass fibers

Glass degradation is a surface erosion phenomena and degradations products are alkali-, earth alkali- salts or hydroxides and silicic acid

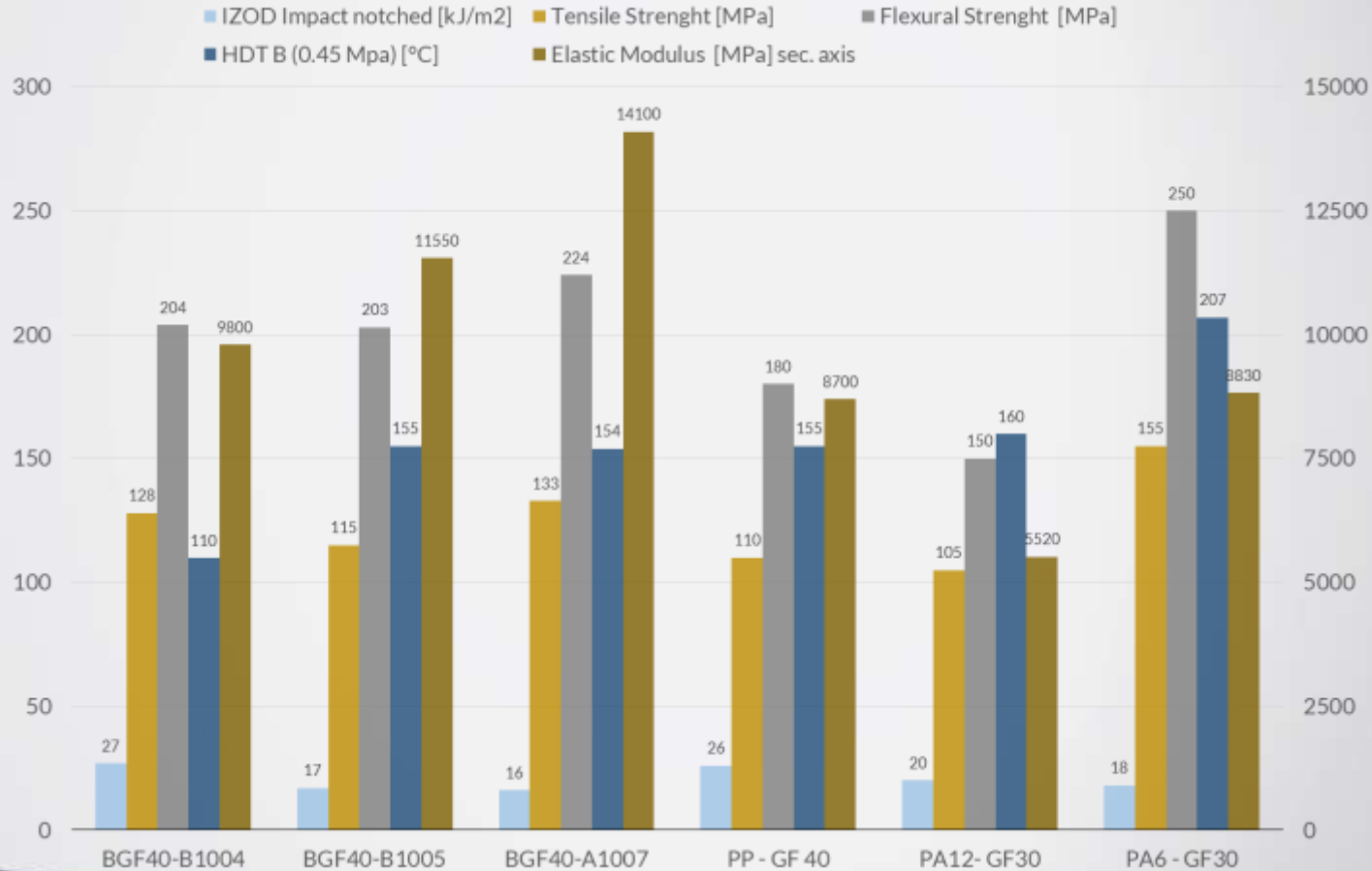


# ABM ADHESION (SIZING) TECHNOLOGY

The adhesion needs to be tailored for each polymer matrix to ensure good adhesion and mechanical properties



# BIOGLASS FIBER REINFORCED PRODUCTS

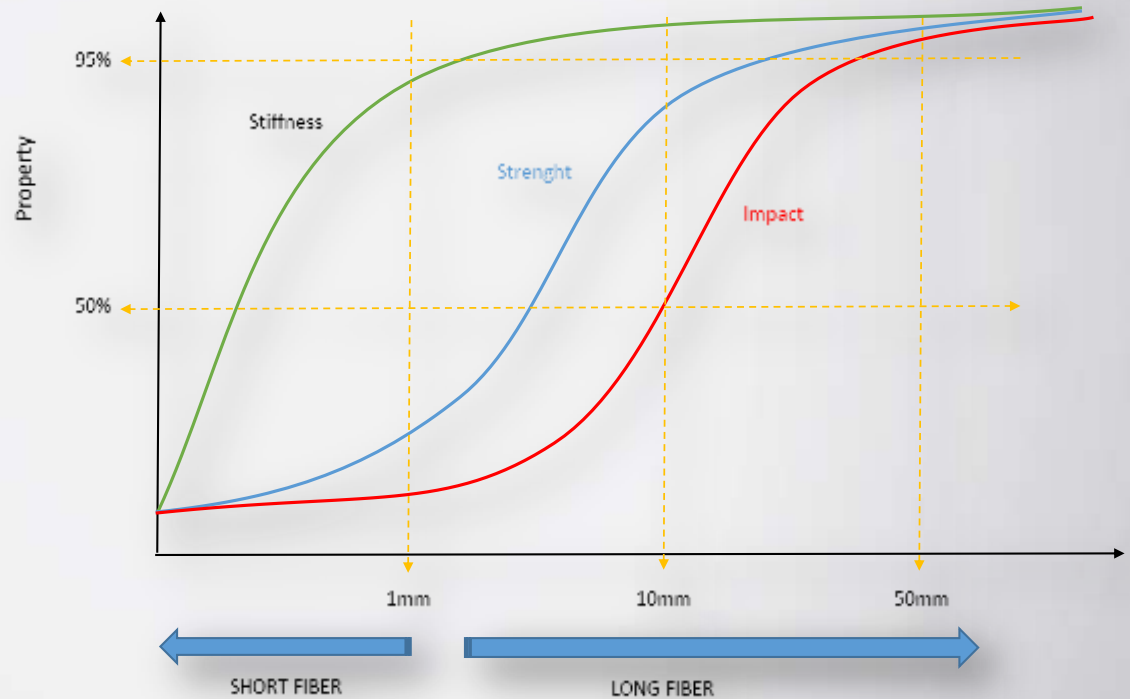




# LENGTH OF FIBER INCREASES PROPERTIES

Glass fiber length in the final product is directly proportional to the mechanical properties of the final product.

Typical fiber length in ABM LFT products is between 8-12mm.

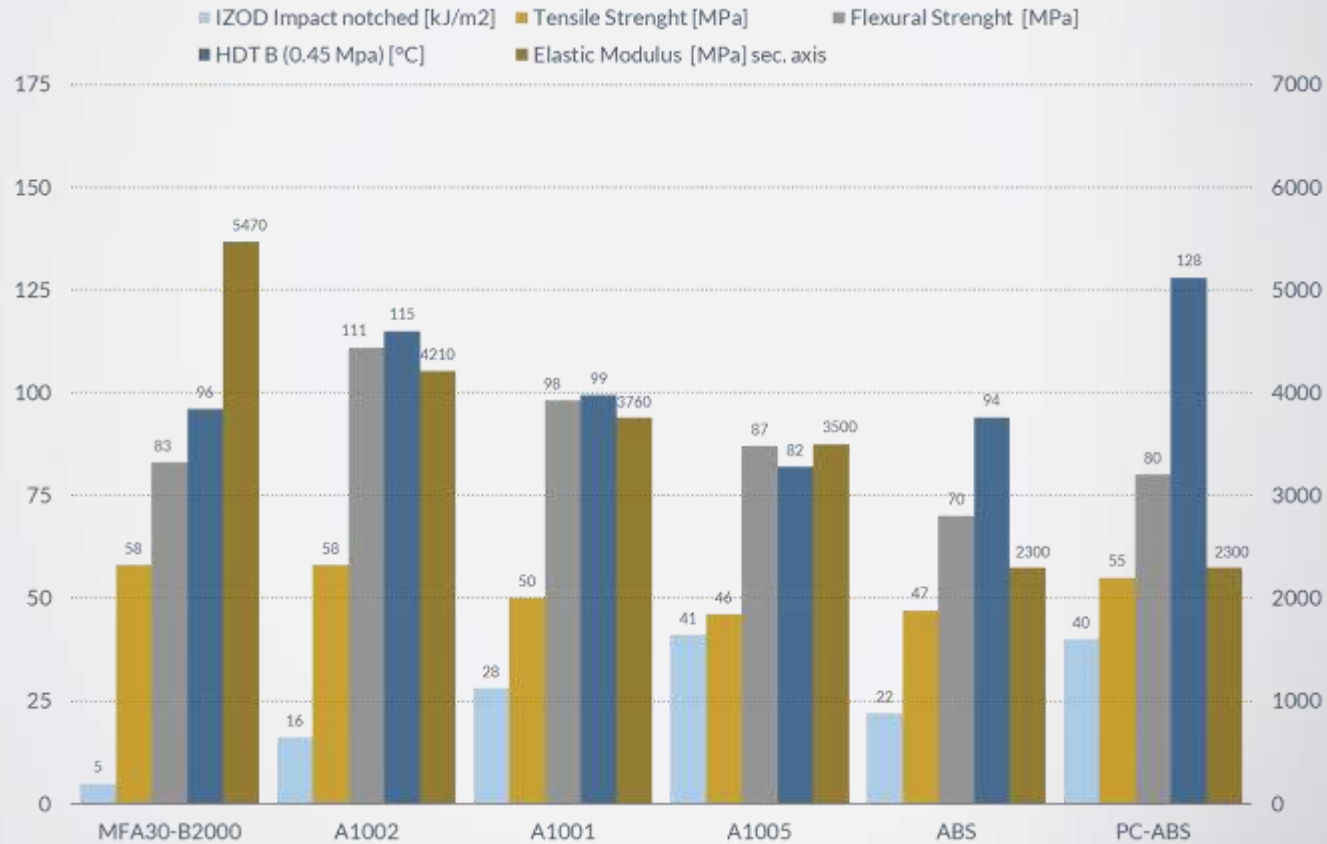


# BIODEGRADABLE GLASS FIBER - PLA COMPOSITE

ABM has developed PLA-based biodegradable glass fiber composites with high mechanical properties (flex and impact) and good temperature resistance without need of in-mould annealing as traditionally with PLA enabling fast cycle times

Grade	Mold [°C]	Cycle time [s]	Flexural Strength ISO 178 [MPa]	Flexural Modulus ISO 178 [MPa]	Tensile Strength ISO 527 [MPa]	Strain @ Break ISO 527 [%]	Young's Modulus ISO 527 [MPa]	Impact Izod Notched [KJ/m <sup>2</sup> ]	HDT A (1.8 MPa) [°C]
BGF20-AG	30	20	132	6550	88	1,7	7141	18	109
BGF30-AG	30	20	146	8150	94	1,5	8674	20	112
BGF40-AG	30	20	210	10540	129	2,1	10733	30	110
BGF40-A1	110	55	206	13130	129	1,3	13000	14	162

# COMPOUNDED BIO-BASED PRODUCTS



# VALUE-ADDED: ANTIMICROBIAL

Testing according to ISO 22196 and Jis Z 2801 (Measurement of antibacterial activity on plastics surfaces) against E.Coli and S. Aureus

	Number of Living Bacteria E.Coli			Antimicrobial activity value	Reduction %
	Start (per cm <sup>2</sup> )	24 hours (per piece)	24 hours (per cm <sup>2</sup> )		
Blank	1.8 x 10 <sup>4</sup>	6.2 x 10 <sup>6</sup>	1.6 x 10 <sup>6</sup>	-----	-----
ABM	1.8 x 10 <sup>4</sup>	500	56	>4.2	99.99

	Number of Living Bacteria S.Aureus			Antimicrobial activity value	Reduction %
	Start (per cm <sup>2</sup> )	24 hours (per piece)	24 hours (per cm <sup>2</sup> )		
Blank	7.2 x 10 <sup>3</sup>	7.8 x 10 <sup>5</sup>	2.0 x 10 <sup>5</sup>	-----	-----
ABM	7.2 x 10 <sup>3</sup>	<100	<11	>4.2	99.99

Combined effect of glass composition containing oxides and ions

# APPLICATION AREAS



**Houseware**  
Microwave  
Dishwasher  
Creep  
Food approval



**Automotive**  
Temp resistant  
High impact  
High stiffness



**Electronics**  
Dimensional  
stability  
Flatness  
Weld line strenght



**Healthcare**  
Medical approved  
ISO certified  
manufacturing  
Continuous fiber  
products

# END OF LIFE OPTIONS



Recycling



Incineration



Composting



Chemical Recycling  
(depolymerisation  
back to monomer)

# BIODEGRADATION CERTIFICATION

DIN CERTCO recognized third-party testing organization for testing according to EN 13432

*“Packaging - Requirements for packaging recoverable through composting and biodegradation”.*



Precisely Right.



# ANALYTICAL SERVICES

Molecular weight GPC (triple detection)

Viscosity (inherent, intrinsic, dynamic)

Monomer Residues GC

Thermal properties DSC

Particle size LS

Identification ATR-FTIR

Heavy metals and catalyst residues  
AAS, SEM-EDX

Mechanical properties (tensile, bending, compression, shear, torsion, impact)

Surface properties SEM-EDX

Solvent residues GC

Long term weatherability and UV testing

MFR/MFI

HDT A/B and Vicat



# SUMMARY

Degradable glass fiber as reinforcement

New level of performance for biopolymers

World class analytical and technical service

# CONTACT DETAILS

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