



Graftabond



FUNCTIONAL MODIFIERS

Compatibilizers are used to promote interfacial adhesion in polymer compounds, which are otherwise immiscible. They usually contain multiple functional groups, with both groups being compatible with one of the phases. These molecules tend to concentrate at the interfaces and stabilize them, thus allowing finer dispersion and compatibility of mutually incompatible pairs

Coupling agents are chemicals which improve the interfacial properties of mineral fillers and polymers (they reduce the interfacial tension which is disadvantageous rather than advantageous, but simultaneously they reduce the agglomeration tendency of filler particles, thus improving their accessibility to polymer molecules). Coupling agents usually react with the filler surface but exhibit at least one side group which react with the polymer matrix or is at least compatible with it.

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ADVANTAGES OF OUR PROPRIETARY GRAFTING TECHNOLOGIES

GRAFT POLYMER PRODUCTS	COMPETITORS PRODUCTS
<p>> 90% Grafting efficiency</p> <p>Almost no residual chemicals→LOWER VOC</p>	<p>30-50% Grafting Efficiency</p> <p>A higher amount of leftover reagents → may disrupt polymer processing</p>
<p>“Blocked Grafting”: Functional groups such as MAH are activated at higher temperatures (>160°C)</p> <p>The material can be safely stored for at least 36 months.</p>	<p>The material is prone to moisture uptake, hydrolysis occurs, and it is reduced in effectiveness by up to 5 times</p>
<p>HIGH grafting degree, UP to 3%</p> <p>By grafting higher amounts of MAH, we substantially reduce the quantity required to achieve good compatibility:</p> <p>Up to 60% less compatibilizers required</p>	<p>Grafting degree up to 2%, with many unreacted monomers present</p>
<p>Very slight MFI reduction when comparing grafted materials to virgin material.</p> <p>(PE) MFI Decreases from 8 g/10min to 6 g/10min</p> <p>Grafted material retains good flowing capabilities</p> <p>(PP) MFI Decreases from 30 g/10min to 18 g/10min</p> <p>Higher melt strength and stability, almost no chain degradation</p>	<p>Big difference in MFI of grafted materials when comparing to same virgin materials.</p> <p>(PE) MFI Decrease from 8 g/10min to 0,8g/10min, Worse flowing capabilities than virgin material, making it harder to process</p> <p>(PP) MFI increases from 30 g/10min to 100 g/10min</p> <p>A lot of degradation and chain shortening</p>

GRAFT POLYMER PRODUCTS	COMPETITORS PRODUCTS
<p>Grafting reaction temperatures are low, at the melting temperature of polymers (140°C-150°C for polyolefin)</p> <p>No material degradation, a whiter color of grafted material and no additional antioxidants are present.</p>	<p>Grafting reaction temperatures are at polymer degradation temperatures (270°C)</p> <p>Grafted material is degraded, more yellow has additional antioxidants</p>
<p>ONE step grafting process</p> <p>Extruder or solid phase reactor, with no additional process steps</p>	<p>Longer grafting process</p> <p>Grafted with two extruders, sometimes grafted in solid phase reactor and extruder (MIX), making the process more resource consuming</p>
<p>White grafted material</p> <p>Doesn't affect final product color</p>	<p>Yellow grafted material</p> <p>May influence final material's color</p>

The versatility of Grafting Monomers

MALEIC ANHYDRIDE (MAH)

GLYCIDYL METHACRYLATE (GMA)

METHYL METHACRYLATE (MMA)

ACRYLIC ACID (AAc)

BUTYL ACRYLATE (BA)

VINYL ACETATE (VA)

DIETHYL MALEATE (DEM)

ACRYLAMIDE (AAm)

ACRYLONITRILE (ACN)

OTHERS.

GRAFTABOND™			Reactive Monomer	Grafting Degree [%]	Form	Olefin/PA Blends	Glass Fiber or Mineral Filled Olefins	Natural Fiber Filled Olefins	Metal Adhesion	Polymer Film Adhesion	Non-Halogen FR	Flow Enhancer	Dispersing Agent (Pigments)	Mixed Recyclates PE/PP	ABS	PA	SAN	PVC WPC	PC	Polyesters (PET,PBT)
HD-MAH	02030	C	MAH	2,5-3	Granule	•		•	•	•	•									
HD-GMA	02530	C	GMA	2,5-3	Granule														•	•
LD-MAH	00130	TL	MAH	2,5-3	Granule				•	•	•									
LD-MAH	02030	C	MAH	2,5-3	Granule	•		•	•	•	•									
LD-MAH	11530	CA	MAH	2,5-3	Granule		•	•				•	•							
LL-MAH	00230	TL	MAH	2,5-3	Granule				•	•	•									
LL-MAH	02030	C	MAH	2,5-3	Granule	•		•	•	•	•									
LL-GMA	00330	C	GMA	2,5-3	Granule															•
PO-MAH	00410	IM	MAH	0,5-1,3	Granule	•										•				
PO-GMA	00515	IM	GMA	≈1,5	Granule				•										•	•
PO-SAN	00647	IM	SAN	3,5-4	Granule										•		•			
EP-MAH	02010	IM	MAH	0,5-1,3	Granule	•										•				
PPH-MAH	02030	C	MAH	2,5-3	Granule	•			•	•										
PPH-MAH	70025	CA	MAH	≈2,5	Granule		•	•			•	•	•							
PPC-GMA	02030	C	GMA	2,5-3	Granule														•	•
EV-MAH	12010	TL	MAH	0,5-1,3	Granule				•	•										
EV-GMA	15025	TL	GMA	≈2,5	Granule				•	•									•	•
EV-GMA	15025	IM	GMA	≈2,5	Granule														•	•
EB-MAH	00730	C	MAH	2,5-3	Granule	•			•	•						•				
EB-MAH	00710	IM	MAH	0,5-1,3	Granule											•				
EB-GMA	01030	C	GMA	2,5-3	Granule				•	•									•	•
EB-GMA	01520	CE	GMA	-	Granule															•
SB-MAH	03020	IM	MAH	1,5-2	Granule	•										•	•			
SB-MAH	00220	IM	MAH	1,5-2	Granule	•										•	•			
SB-GMA	00330	C	GMA	2,5-3	Granule				•								•		•	•
SEBS-GMA	02520	IM	GMA	≈2	Granule			•											•	•
SEBS-MAH	02015	IM	MAH	≈1,5	Granule	•	•	•								•				

Table continued on the next page

<i>GRAFTABOND™</i>			Reactive Monomer	Grafting Degree [%]	Form	Olefin/PA Blends	Glass Fiber or Mineral Filled Olefins	Natural Fiber Filled Olefins	Metal Adhesion	Polymer Film Adhesion	Non-Halogen FR	Flow Enhancer	Dispersing Agent (Pigments)	Mixed Recyclates PE/PP	ABS	PA	SAN	PVC WPC	PC	Polyesters (PET,PBT)
SAN-MAH	01530	C	MAH	2,5-3	Granule										•		•			
ABS-MAH	01510	C	MAH	0,5-1,3	Granule										•		•			
CP-MAH	00020	IM	MAH	1,5-2	Powder													•		
ECO	01030	C	MAH GMA	2,5-3	Granule									•						
ECO-PO/M/G	00325	C	MAH GMA	≈2	Granule									•						
UHHD-GMA	00020	IM	GMA	1,5-2	Granule	•		•	•	•	•									
UHHD-MAH	00020	IM	MAH	1,5-2	Granule														•	•

General Recommendations for different blends:

<i>GRAFTABOND™</i>	Type	Reactive Monomer	Grafting Degree [%]	PET/PE 1/5 of PE	PA/PE 1/5 of minor component	PA/PP 1/5 of minor component	PLA/PP 1/5 of minor component	PLA/PE 5-10 % of chosen grades	PC/ABS alloys 5 % of chosen grades	PC/PBT alloys 5-10 % of chosen grades
HD-MAH	02030	C	MAH	2,5-3	•					
HD-GMA	02530	C	GMA	2,5-3	•			•	•	•
LD-MAH	02030	C	MAH	2,5-3	•					
LL-MAH	02030	C	MAH	2,5-3	•					
PPH-MAH	70025	CA	MAH	≈2,5		•				
PPC-GMA	02030	C	GMA	2,5-3			•		•	•
EB-MAH	00730	C	MAH	2,5-3	•					
EB-GMA	01030	C	GMA	2,5-3	•			•	•	•
SB-MAH	03020	C	MAH	1,5-2	•					
SB-GMA	00330	C	GMA	2,5-3	•		•	•	•	•
ABS-MAH	01510	C	MAH	0,5-1,3					•	
UHHD-MAH	00020	IM	MAH	1,5-2	•					
UHHD-GMA	00020	IM	GMA	1,5-2	•			•	•	•

LEGEND:

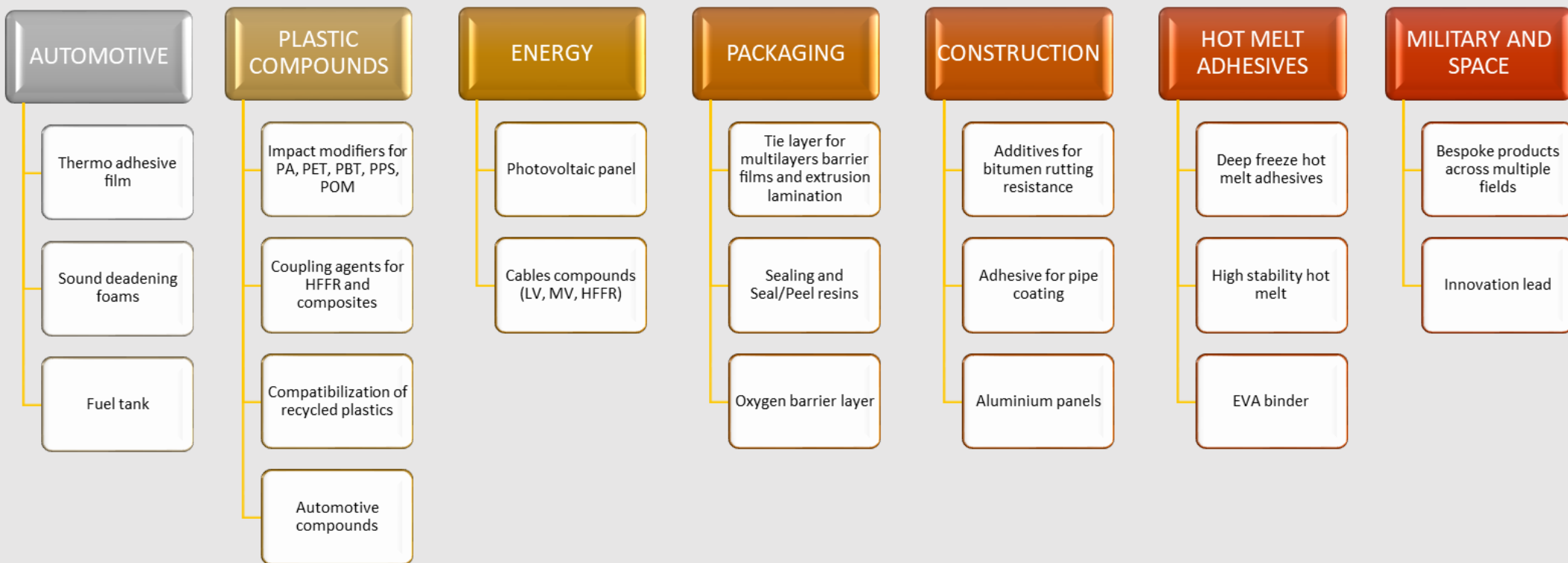
C - Compatibilizer CA - Coupling Agent TL - Tie Layer
IM - Impact Modifier CE – Chain Extender

LEGEND:

Olefin = Polyethylene (PE) and polypropylene (PP)
PA = Polyamide
ABS = Acrylonitrile-butadiene-styrene
SAN = Styrene Acrylonitrile
PC = Polycarbonate

PET = Polyethylene Teraphtalate
PBT = Polybutilene Teraphtalate
PVC = Polyvinyl Chloride
PLA = Polylactic Acid
FR = Flame Retardant
WPC = Wood-Plastic Composite

Where to use...





PRODUCT INFORMATION

GRAFTABOND™

LD-MAH 02030 C

LD-MAH 00130 TL

Maleic Anhydride grafted
LDPE



GRAFTABOND™ LD-MAH 02030 C - compatibilizer in thermoplastic polyolefin/polyamide blends

Special Features and Benefits

- Designed for LDPE based blends
- Improves mechanical properties: stiffness tensile and flexural properties, impact strength,
- High Maleic Anhydride content.

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding)

GRAFTABOND™ LD-MAH 00130 TL - Tie layer adhesive for multi-layer barrier films. Compatibilizer for polyethylene/polyamide compounds used in blow molding. Coupling agent for polyethylene filled halogen free flame retardants (HFFR).

Special Features and Benefits

- Improves mechanical properties: stiffness tensile and flexural properties, impact strength,
- Due to low MFI, it is best used for multi-layer barrier systems and compounds for blow molding

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Coextrusion, extrusion (Compounding), blow molding

GRAFTABOND™

LD-MAH 11530 CA

GRAFTABOND™ LD-MAH 11530 CA- Coupling agent in filled thermoplastic composites, compounds and alloys.

Special Features and Benefits

- Coupling agent for polyethylene compounds with glass, wood and other natural fibers,
- Improves mechanical properties: stiffness tensile and flexural properties, impact strength,
- Reduces water absorption in natural fiber filled composites,
- High Maleic Anhydride content.

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding)





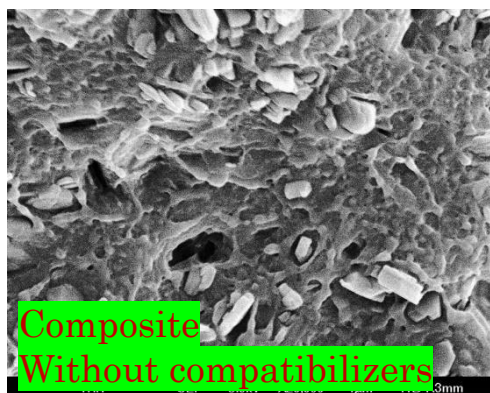
PRODUCT INFORMATION

GRAFTABOND™

LL-MAH 02030 C

LL-MAH 00230 TL

Maleic Anhydride grafted
LLDPE



GRAFTABOND™ LL-MAH 02030 C - Compatibilizer in thermoplastic polyethylene-polyamide composites, compounds and alloys.

Special Features and Benefits

- Improves mechanical properties: stiffness tensile and flexural properties, impact strength.
- High Maleic Anhydride content.

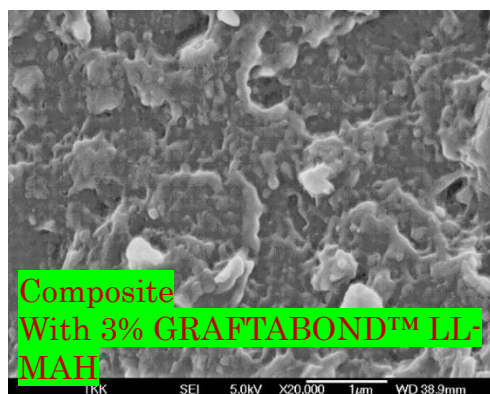
Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding)

GRAFTABOND™ LL-MAH 00230 TL – Improve adhesion between layers of polymer packaging systems. Compatibilizer for polyethylene/polyamide blends for blow molding. Coupling agent for polyethylene filled with halogen free flame retardants (HFFR).

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Coextrusion, extrusion (Compounding), blow molding





PRODUCT INFORMATION

GRAFTABOND™ HD-GMA02530 C

HDPE grafted with Glycidyl
Methacrylate

GRAFTABOND™ HD-GMA02530 C - Compatibilizer in thermoplastic polymer-polymer composites, compounds and alloys. Best when used with PE and polyester (PET, PBT, etc.) compounds.

Special Features and Benefits

- Improves mechanical properties: stiffness tensile and flexural properties, impact strength.
- Good flow properties.

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding)



GRAFTABOND™

HD-MAH 02030 C

Maleic Anhydride grafted
HDPE



PRODUCT INFORMATION

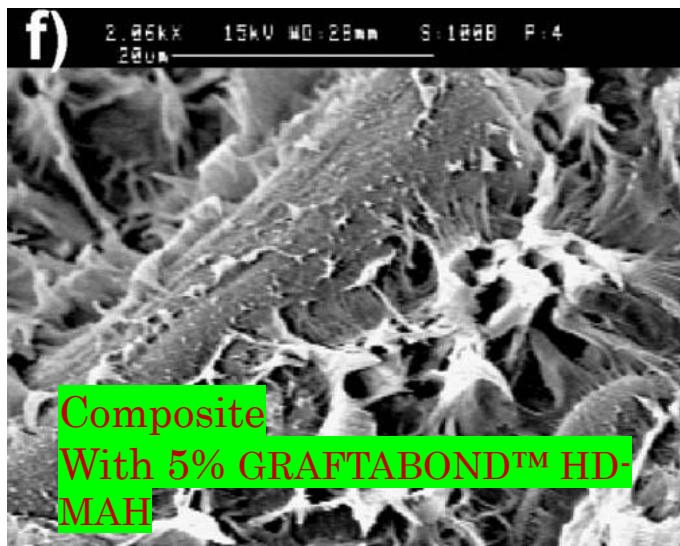
GRAFTABOND™ HD-MAH 02030 C - Compatibilizer in polyethylene/polyamide compounds, blends and alloys.

Special Features and Benefits

- Improves mechanical properties: stiffness tensile and flexural properties, impact strength.
- High Maleic Anhydride content.

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding).





PRODUCT INFORMATION

GRAFTABOND™ PO-MAH 00410 IM - can be used in the following applications:

1. all polyethylene/polyamide blends and
2. Standard toughening agent (golf balls, cable compounds...).

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding)

GRAFTABOND™

PO-MAH 00410 IM

PO-GMA 00515 IM

GRAFTABOND™ PO-GMA 00515 IM - can be used in the following applications: Standard toughening agent (golf balls, cable compounds...) of polyolefin-polyester compounds

Special Features and Benefits

- Improved flexural properties,
- Excellent notched/unnotched Izod and Charpy impact strength.

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding)

**Maleic Anhydride grafted
POE**





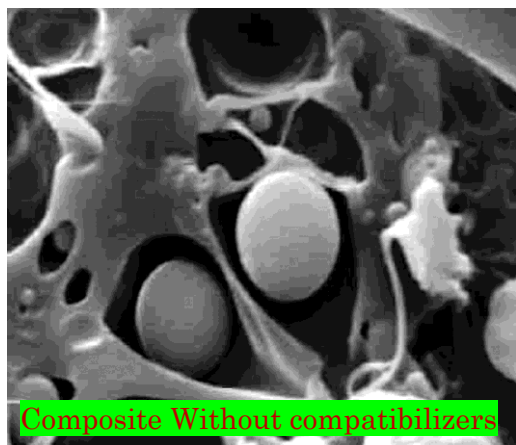
PRODUCT INFORMATION

GRAFTABOND™

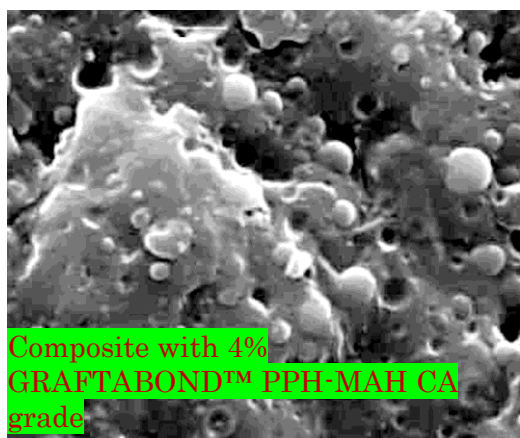
PPH-MAH 02030 C

PPH-MAH 70025 CA

Maleic Anhydride grafted PP
Homopolymer



Composite Without compatibilizers



Composite with 4%
GRAFTABOND™ PPH-MAH CA
grade

GRAFTABOND™ PPH-MAH 02030 C - Compatibilizer for polypropylene/polyamide alloys, and compatibilizer for polypropylene based scrap,

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding)

GRAFTABOND™ PPH-MAH 70025 CA - functions as a coupling agent between reinforcing materials (glass fibers, natural and inorganic fillers) and polypropylene. Increase adhesion properties of polypropylene to metal surfaces.

Special Features and Benefits

Performance enhancements in glass-filled polypropylene:

- Easy processing of glass reinforced compounds and thin/complex parts, because of its high flow properties,
- Improved tensile and flexural properties,
- Excellent notched/unnotched Izod and Charpy impact strength.
- Improved performance and cost compared to older modifiers.

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding)



PRODUCT INFORMATION

GRAFTABOND™ PPC-GMA 02030 C - functions as a compatibilizer for polypropylene and polyester compounds. Increased adhesion properties of polypropylene to metal surfaces.

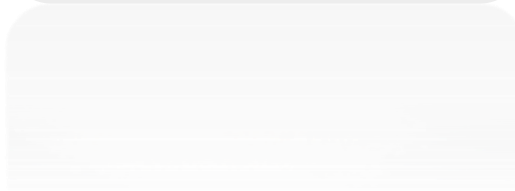
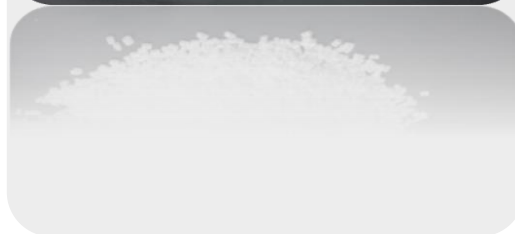
GRAFTABOND™

PPC-GMA 02030 C

Polypropylene grafted with
Glycidyl Methacrylate

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding)





PRODUCT INFORMATION

GRAFTABOND™ CP-MAH 00220 IM - can be used in the following applications: 1. Toughening agent and plasticizer for PVC. 2. Compatibilizer for PVC alloys and blends. 3. Solid component for solvent borne adhesion promoters.

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding)

GRAFTABOND™

CP-MAH 00020 IM

Chlorinated Polyethylene
grafted with Maleic
Anhydride





PRODUCT INFORMATION

GRAFTABOND™

EV-MAH12010 TL

EV-GMA 15025 IM

Maleic Anhydride/Glycidyl
Methacrylate grafted
Ethylene Vinyl Acetate

GRAFTABOND™ EV-MAH12010 TL - is designed for hot melt adhesive formulations. It's compatible with most adhesive resins and waxes. Also suitable to produce thermo-adhesive films for solid substrates (PA, films, Al foils).

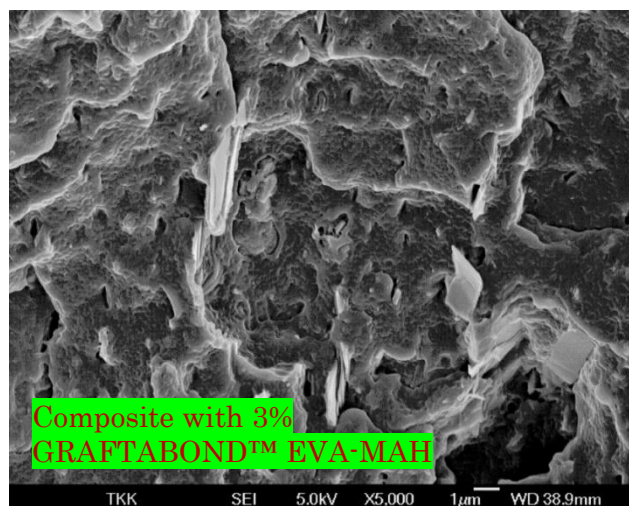
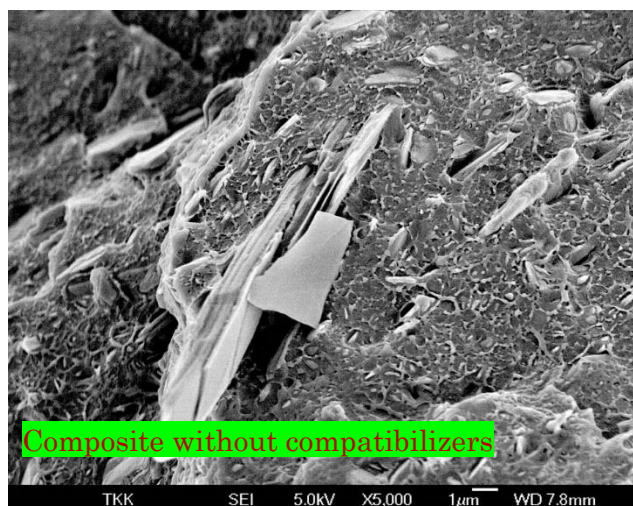
Processing

- is processable on most thermoplastics processing equipment,
- Preferable for: Coextruding, overmolding
- Purge the equipment after a run is completed.

GRAFTABOND™ EV-GMA 15025 IM - is designed for PVC impact modification

Processing

- is processable on most thermoplastics processing equipment,
- Preferable for: Compounding PVC transparent films (Extruding)
- Purge the equipment after a run is completed.





PRODUCT INFORMATION

GRAFTABOND™ EP-MAH 07110 IM - can be used in the following applications: Premium toughening agent and impact modifier for polyamides.

GRAFTABOND™

EP-MAH 02010 IM

Ethylene-Propylene-Diene-Monomer polymer grafted with Maleic Anhydride

Special Features and Benefits

- Improved flexural properties,
- Excellent notched/unnotched Izod and Charpy impact strength.

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding)





PRODUCT INFORMATION

GRAFTABOND™

SB-MAH 00220 IM

SB-MAH 03020 IM

SB-GMA 00330 C

Maleic Anhydride/Glycidyl
Methacrylate grafted Styrene
Butadiene Copolymer

GRAFTABOND™ SB-MAH 00220 IM - is a great additive for increasing toughness of rigid materials. Excellent compatibility with many polymers and polymer compounds.

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding)

GRAFTABOND™ SB-MAH 03020 IM - is a great additive for increasing toughness of rigid materials. Excellent compatibility with many polymers and polymer compounds..

Processing

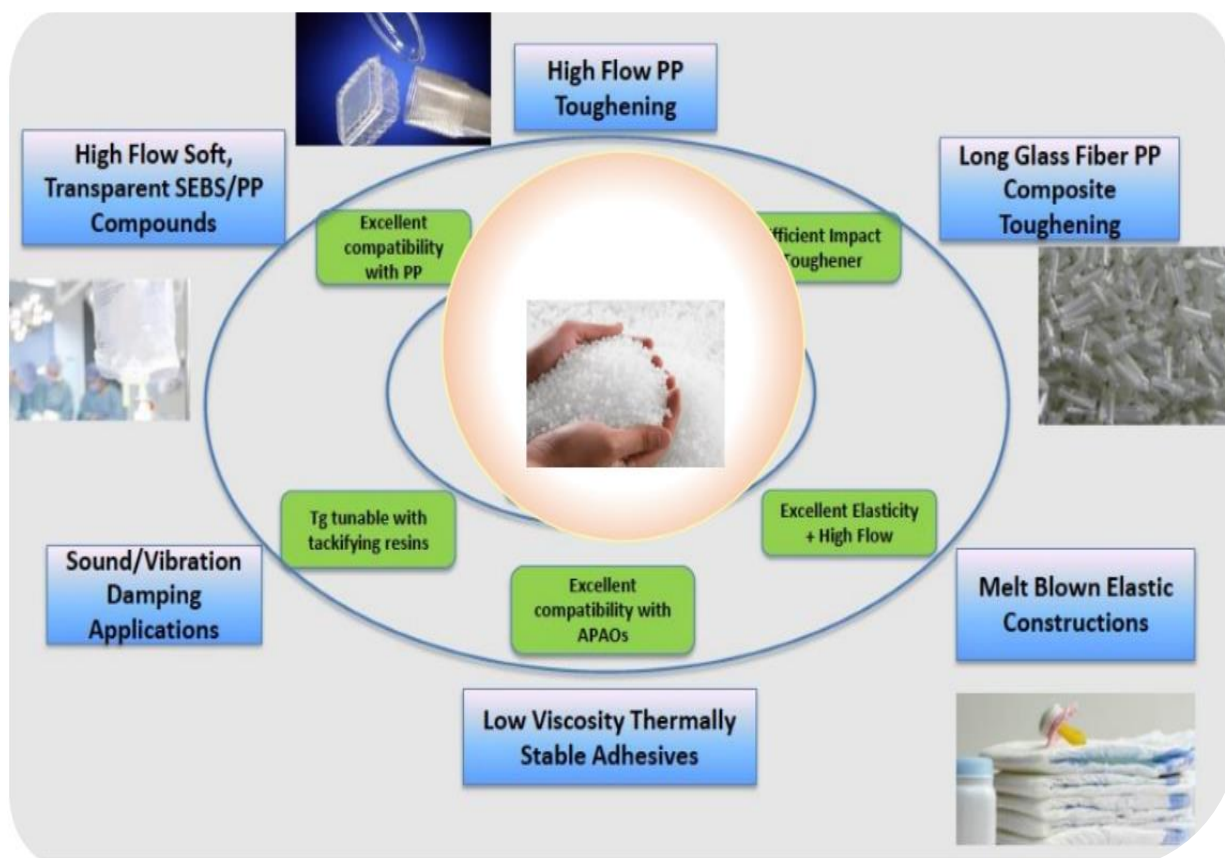
- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding)

GRAFTABOND™ SB-GMA 00330 C - is a great all-around additive for increasing mechanical properties of any polyester compound.

Processing

- Is processable on most thermoplastics processing equipment,
- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding)

Market Applications





PRODUCT INFORMATION

GRAFTABOND™

SEBS-GMA 02520 IM

SEBS-MAH 02015 IM

Glycidyl

Methacrylate/Maleic

Anhydride grafted Styrene

Ethylene Butylene Styrene

Terpolymer

GRAFTABOND™ SEBS-GMA 02520 IM - can be used in the following applications: Standard toughening agent (golf balls, cable compounds...) of polyolefin and polyester compounds.

Special Features and Benefits

- Improved flexural properties,
- Excellent notched/unnotched Izod and Charpy impact strength.

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding), overmolding (Thermoplastic Elastomer)

GRAFTABOND™ SEBS-MAH 02015 IM - can be used in the following applications: Standard toughening agent (golf balls, cable compounds...) of polyolefin compounds with many different polymers (polyamides, styrene based polymers, different fillers...)

Special Features and Benefits

- Improved flexural properties,
- Excellent notched/unnotched Izod and Charpy impact strength,
- Versatile applications.

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding), overmolding (Thermoplastic Elastomer)





PRODUCT INFORMATION

GRAFTABOND™ EB-MAH 00730 C - is a great compatibilizer for polyolefin/polyamide blends.

Processing

- Is processable on most thermoplastics processing equipment,
- Preferable for: Extrusion (Compounding)
- It is recommended to avoid overheating above 320°C,
- Purge the equipment after a run is completed.

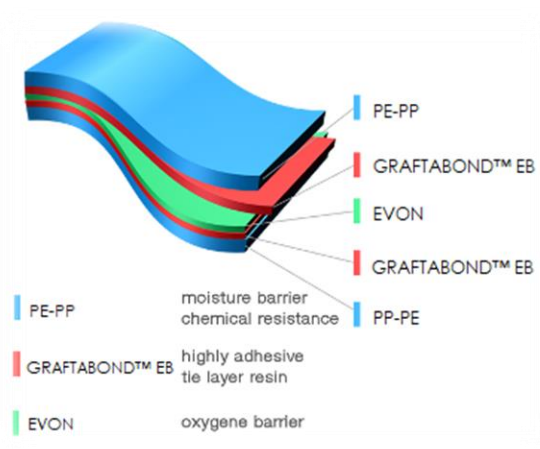
GRAFTABOND™

EB-MAH 00730 C

EB-MAH 00710 IM

Maleic Anhydride/Glycidyl
Methacrylate grafted
Ethylene Butyl Acrylate

GRAFTABOND™ EB-MAH 00710 IM - is a great impact modifier for polyolefin/polyamide blends and polyolefin composites, filled with glass fibers, natural fibers and inorganic fillers.



Processing

- GRAFTABOND™ EB-MAH 00710 IM is processable on most thermoplastics processing equipment,
- Preferable for: Extrusion (Compounding)
- It is recommended to avoid overheating above 320°C,
- Purge the equipment after a run is completed.

GRAFTABOND™ EB-GMA 01030 C

GRAFTABOND™ EB-GMA 01030 C - is a great compatibilizer for: Polyolefin-polyester based compounds.

Processing

- GRAFTABOND™ EB-GMA 01030 C is processable on most thermoplastics processing equipment
- Preferable for: Extrusion (Compounding)
- It is recommended to avoid overheating above 320°C
- Purge the equipment after a run is completed

GRAFTABOND™ PO-SAN 00647 IM

Styrene-Acrylonitrile grafted
UHMWPE and POE



PRODUCT INFORMATION

GRAFTABOND™ PO-SAN 00647 IM - is a great additive for increasing impact strength of soft materials. Excellent compatibility with polymers, containing nitrile or amide groups (e.g. SAN, ABS).

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding)

GRAFTABOND™

SAN-MAH 01530 C

Styrene-Acrylonitrile
copolymer grafted with
Maleic Anhydride



GRAFTABOND™

ABS-MAH 01510 C

Acrylonitrile-butadiene-
styrene grafted with Maleic
Anhydride



PRODUCT INFORMATION

GRAFTABOND™ SAN-MAH 01530 C - is a great compatibilizer for polymer blends, based on SAN, ABS and other acrylonitrile based polymers.

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding)



PRODUCT INFORMATION

GRAFTABOND™ ABS-MAH 01510 C is a great compatibilizer for increasing mechanical properties of ABS and SAN blends with polyamides, and glass fiber reinforced SAN, ABS and other styrene based polymers.

Processing

- Is processable on most thermoplastics processing equipment.
- Preferable for: Extrusion (Compounding)



PRODUCT INFORMATION

GRAFTABOND™

ECO 01030 C

ECO-PO/R00325 C

Custom-made

Compatibilizers (in accordance
with scrap mixture)

Use Antioxidants bound
Compatibilizers

Use Proprietary Chain
Extenders

GRAFTABOND™ ECO 01030 C - Increase mechanical properties of plastic scrap materials and mixtures of different polymers (e.g. polyolefins, polyamides and polyesters). Compatibilizer in thermoplastic composites, compounds and alloys with such materials

Special Features and Benefits

- Improves mechanical properties: stiffness tensile and flexural properties, impact strength

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding of recycled materials)

GRAFTABOND™ ECO-PO/R 00325 C is designed to provide compatibility to polyolefin based recycled plastic scrap and mixtures. It enhances mechanical and processing properties of all polyolefin blends.

Special Features and Benefits

- Increase mechanical properties of plastic scrap materials and mixtures of different polyolefins
- Compatibilizer in thermoplastic composites, compounds and alloys with such materials
- Improves mechanical properties: stiffness tensile and flexural properties, impact strength

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding of recycled materials)



PRODUCT INFORMATION

GRAFTABOND™

UHHD-MAH 00020 IM

UHHD-GMA 00020 IM

Functionalized Ultra High
Molecular Weight
Polyethylene Blend with
Maleic Anhydride / GMA

GRAFTABOND™ UHHD-MAH 00020 IM is an alloy of HDPE and UHMWPE, grafted with maleic anhydride. It is a great compatibilizer for polyethylene blends and an excellent toughening agent, due to the UHMWPE.

Special Features and Benefits

- Compatibilizer in engineering plastics composites, compounds and alloys as impact modifier.

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding)

GRAFTABOND™ UHHD-GMA 00020 IM- Impact modifier in thermoplastic polymer-polymer composites, compounds and alloys. Best when used with PE and polyester (PET, PBT, etc.) compounds excellent impact modifier, due to the UHMWPE.

Special Features and Benefits

- Improves mechanical properties: stiffness tensile and flexural properties, impact strength.
- Good flow properties.

Processing

- Processable on most thermoplastic processing equipment.
- Preferable for: Extrusion (Compounding)