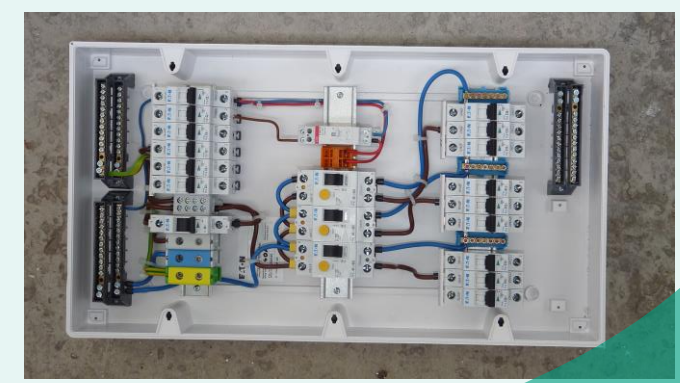
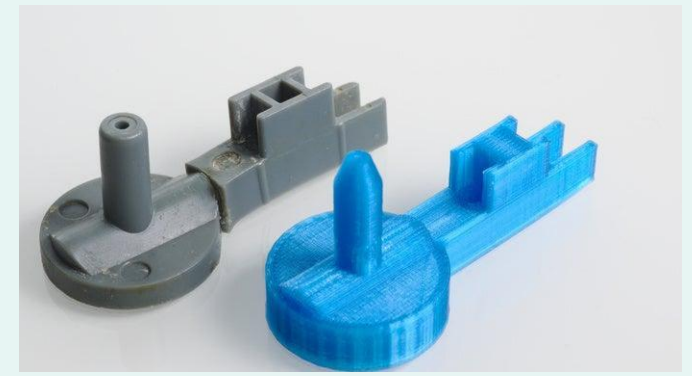


GRAFT POLYMER
COMBINE INCOMPATIBLE

POLYMERIC ALLOYS
GRAFTALLOY

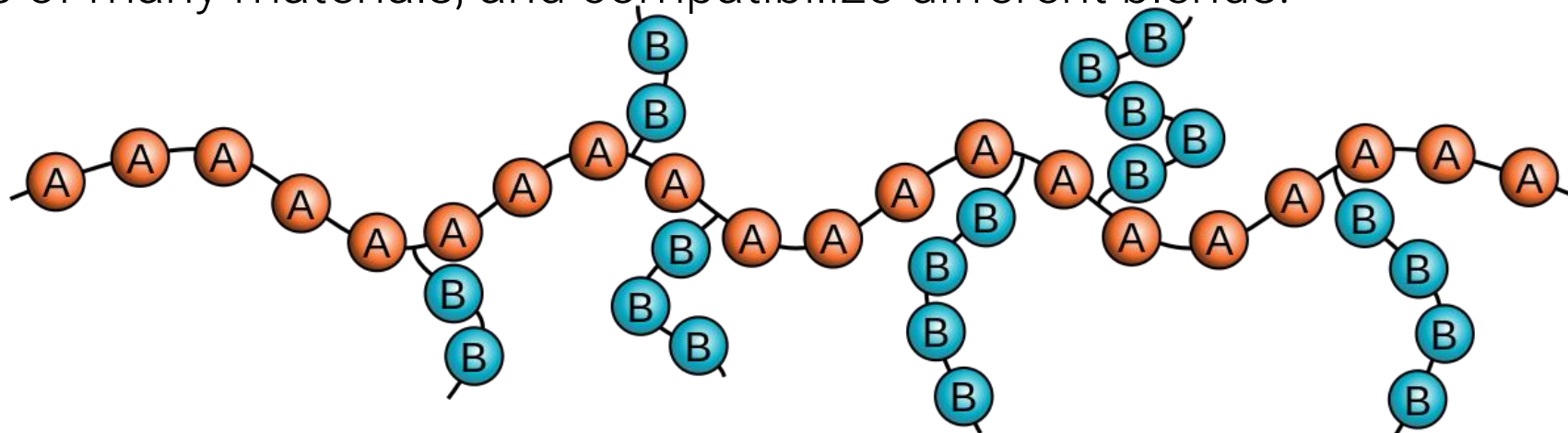


INTRODUCTION

Graftalloy products are the combination of the best properties of separate materials.

They were made to create the best Co-continuous nano-morphology.

By grafting branch polymers to polyolefin-based polymers, we can improve the properties of many materials, and compatibilize different blends.



PRODUCT GRADES

Item	Test Method	Unit	GRAFTALLOY™ Grade				
			LD-PS	LD-SAN	PP-SAN	EB-PS	EB-SAN
Main Chain Polymer	-	-	LDPE	LDPE	PP	EBA	EBA
Branch Polymer	-	-	PS	SAN	SAN	PS	SAN
MFI	ISO 1133	g/10 min	190°C, 2,16 kg	190°C, 2,16 kg	230°C, 2,16 kg	190°C, 2,16 kg	190°C, 2,16 kg
			57,44	35	27	6,8	6,9
Tensile Strength at Yield	ISO 527, 1A, 20 mm/min	MPa	5,3	8,5	28,6	8,8	10
Elongation at Break	ISO 527, 1A, 20 mm/min	%	11	9,8	4,2	40	30
Melting Temp.	DSC	°C	100	100	160	95	95

OUR RECOMMENDATIONS

Blend	GRAFTALLOY grade
Polyolefin + PS	LD-PS / PP-SAN
Polyolefin + ABS	LD-SAN /PP-SAN /EB-SAN
Polyolefin + PLA	LD-SAN
Polyolefin + PET	EB-SAN
Polyolefin + PBT	EB-SAN
Polyolefin + PC	LD-PS / PP-SAN
Polyolefin + mPPE	LD-PS
PS + PLA	EB-PS
PS + PA	EB-PS
PS + PBT	EB-PS
PS + PC	EB-PS
ABS + PLA	EB-SAN
ABS + mPPE	EB-SAN
ABS + PC	EB-SAN

Blend	GRAFTALLOY grade
PMMA + PET	EB-SAN
PMMA + PBT	EB-SAN
PLA + PA	EB-SAN
PLA + PBT	EB-SAN
PLA + PC	EB-SAN
PA + PET	EB-SAN
PA + PBT	EB-SAN
PA + PC	EB-SAN
PA + mPPE	EB-PS
PET + PC	EB-SAN
PBT + PC	EB-SAN
PBT + mPPE	EB-PS

GRAFTALLOY LD-PS 06000



GRAFTALLOY™ LD-PS 06000 - is a high performance polymer alloy, consisting of LDPE, with chemically bound PS.

Applications

- Improve tribological properties (POM, PA, ABS, PBT, PC, PPS, mPPE)
- Improve Melt Flow Index of blends (mPPE, TPE)
- Improves mechanical characteristics
- Improves scratch resistance (ABS, PMMA, PC)

Processing

- Can be processed with all usual processing technologies (Injection moulding, extrusion, blow moulding, thermoforming)
- Optimal processing temperatures are between 180°C and 200°C.

GRAFTALLOY LD-SAN 03000



GRAFTALLOY™ LD-SAN 01000 - is a high performance polymer alloy, consisting of LDPE, with chemically bound SAN.

Applications

- Improve tribological properties (POM, PA, ABS, PBT, PC, PPS, mPPE)
- Improves scratch resistance (ABS, PMMA, PC)

Processing

- Can be processed with all usual processing technologies (Injection moulding, extrusion, blow moulding, thermoforming...)
- Optimal processing temperatures are between 180°C and 200°C.

GRAFTALLOY LD-PS & GRAFTALLOY LD-SAN

GRAFTALLOY™ LD-PS / LD-SAN improve tribological properties.

Example:

We measured mass loss from abrasion and coefficient of friction of:

POM

POM + 10 wt.% GRAFTALLOY™ LD-PS

PTFE

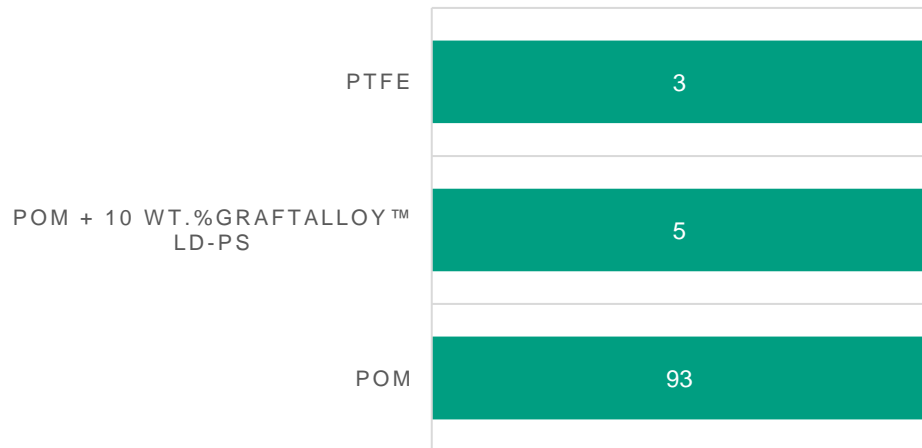
GRAFTALLOY™ LD-PS improves:

- ✓ Abrasion loss
- ✓ Coefficient of kinetic friction

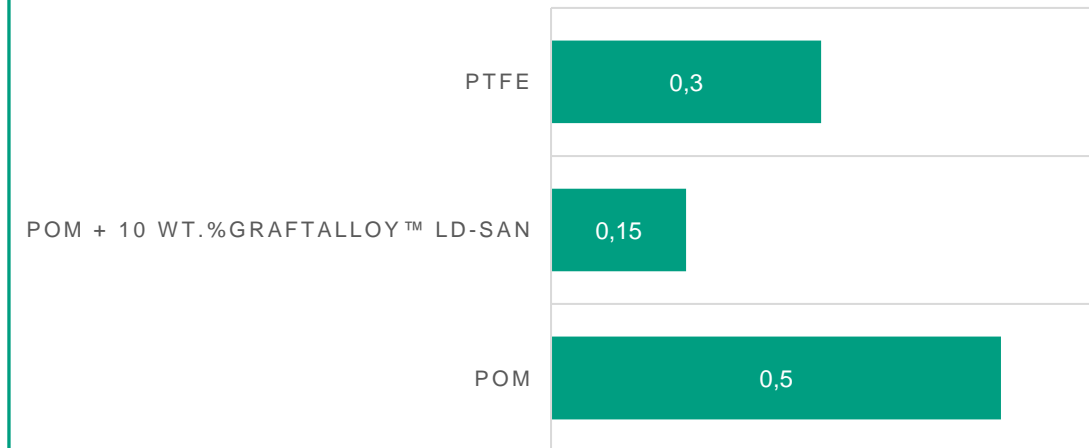


POM with GRAFTALLOY™ LD-PS / SAN - has better tribological properties than PTFE.

ABRASION LOSS [MG]



COEFFICIENT OF FRICTION



GRAFTALLOY PP-SAN 03000

GRAFTALLOY™ PP-SAN 03000 - is a high performance polymer alloy, consisting of PP, with chemically bound SAN.

Applications

- Improve trixotropy of PP
- Improve Melt Flow Index of blends (with PP, ABS, TPE)
- Improves impact strength (PMMA, PA, PET, PBT, PPS)
- Improve compatibilization (with PMMA, PLA, PA, PET, PBT)

Processing

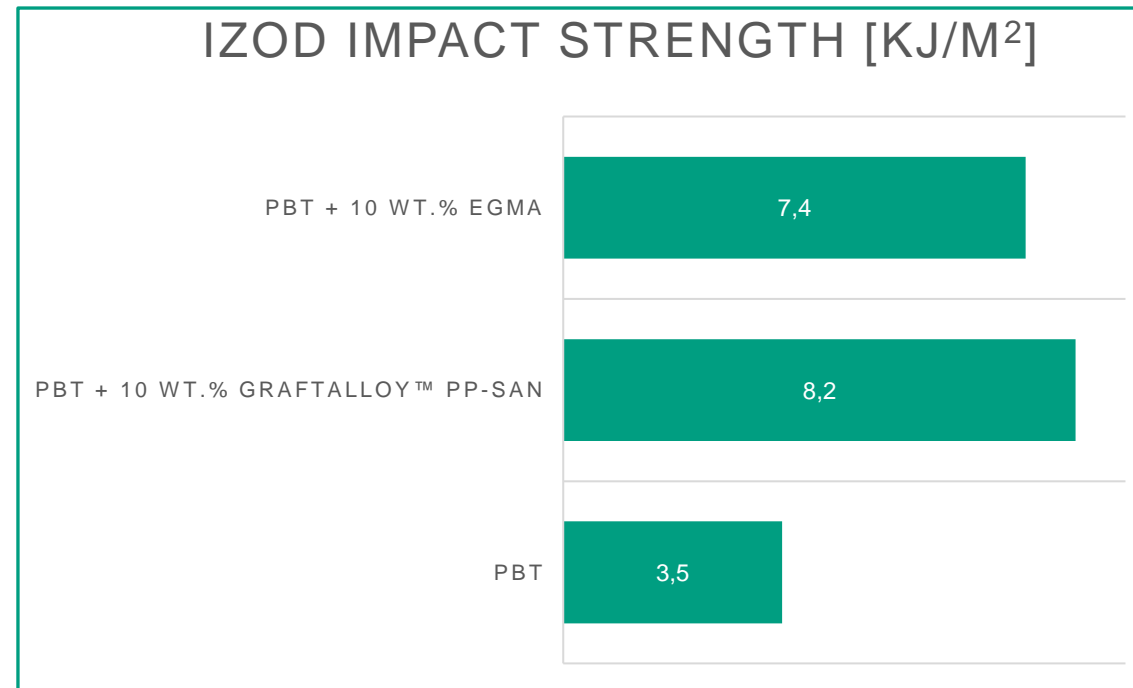
- Can be processed with all usual processing technologies (Injection moulding, extrusion, blow moulding, thermoforming)
- Optimal processing temperatures are between 180°C and 200°C.



GRAFTALLOY PP-SAN 03000

GRAFTALLOY™ PP-SAN improves Impact Strength

Example:
Comparing Izod impact strength of:
PBT
PBT + 10 wt.% GRAFTALLOY™ PP-SAN
PBT + 10 wt.% EGMA



! PBT with GRAFTALLOY™ PP-SAN has better Izod Impact Strength than PBT with EGMA.

GRAFTALLOY EB-PS 00700

GRAFTALLOY™ EB-PS 00700 is a high performance polymer alloy, consisting of EBA, with chemically bound polystyrene.

Applications

- Impact modifier
- Improves mechanical characteristics (for PLA, PA, PBT)
- Increases abrasion resistance

Processing

- GRAFTALLOY™ EB-PS 00700 can be processed with all usual processing technologies (Injection molding, extrusion, blow molding, thermoforming...)
- Optimal processing temperatures are between 180°C and 200°C.



GRAFTALLOY EB-SAN 00700



GRAFTALLOY™ EB-SAN 00700 - is a high-performance polymer alloy, consisting of EBA, with chemically bound SAN.

Applications

- Impact modifier (for PET, PBT, PPS, PA)
- Improves mechanical characteristics
- Increases abrasion resistance
- Matting (for ABS, PP)

Processing

- Can be processed with all usual processing technologies (Injection moulding, extrusion, blow moulding, thermoforming...)
- Optimal processing temperatures are between 180°C and 200°C.

GRAFTALLOY EB-SAN 00700

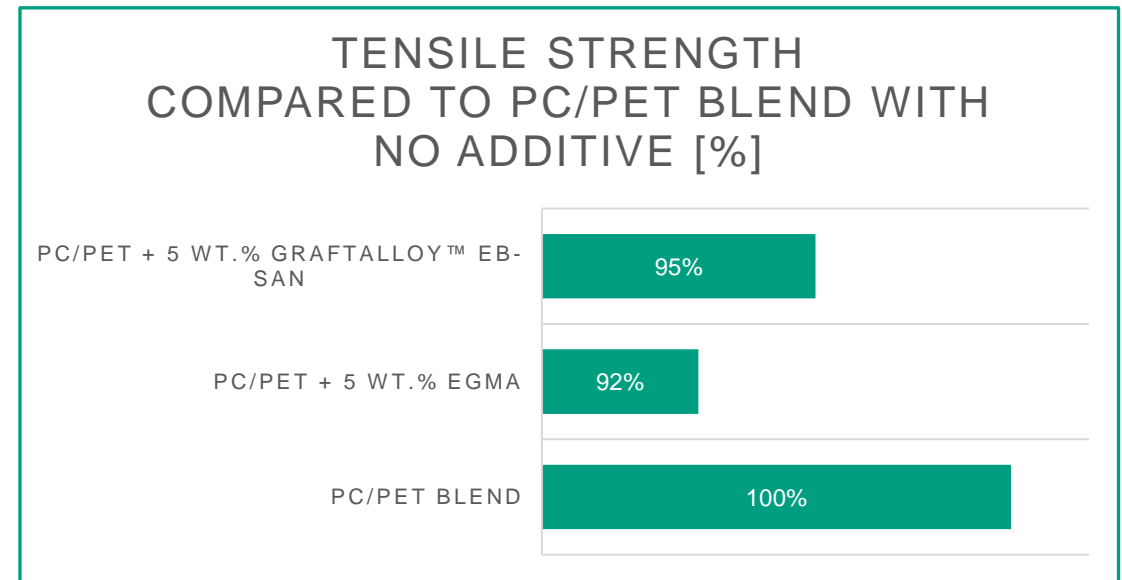
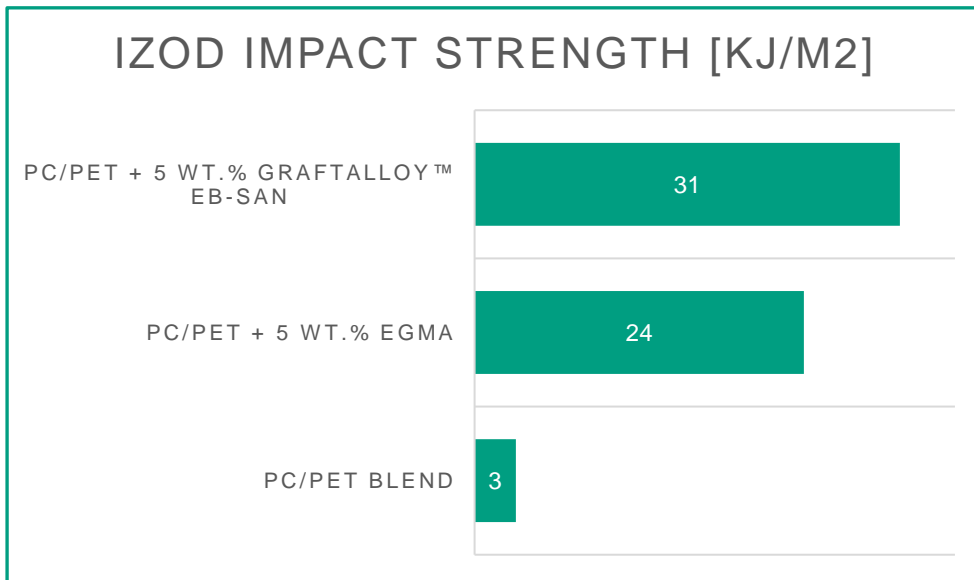
Improve compatibility and mechanical properties of blends with GRAFTALLOY™.

Example:

PC/PET blend

PC/PET + 5 wt.% GRAFTALLOY™ EB-SAN

PC/PET + 5 wt.% EGMA



Impact Strength of blend increases significantly, with only 5% reduction in maximum tensile stress, when using GRAFTALLOY™ EB-SAN.

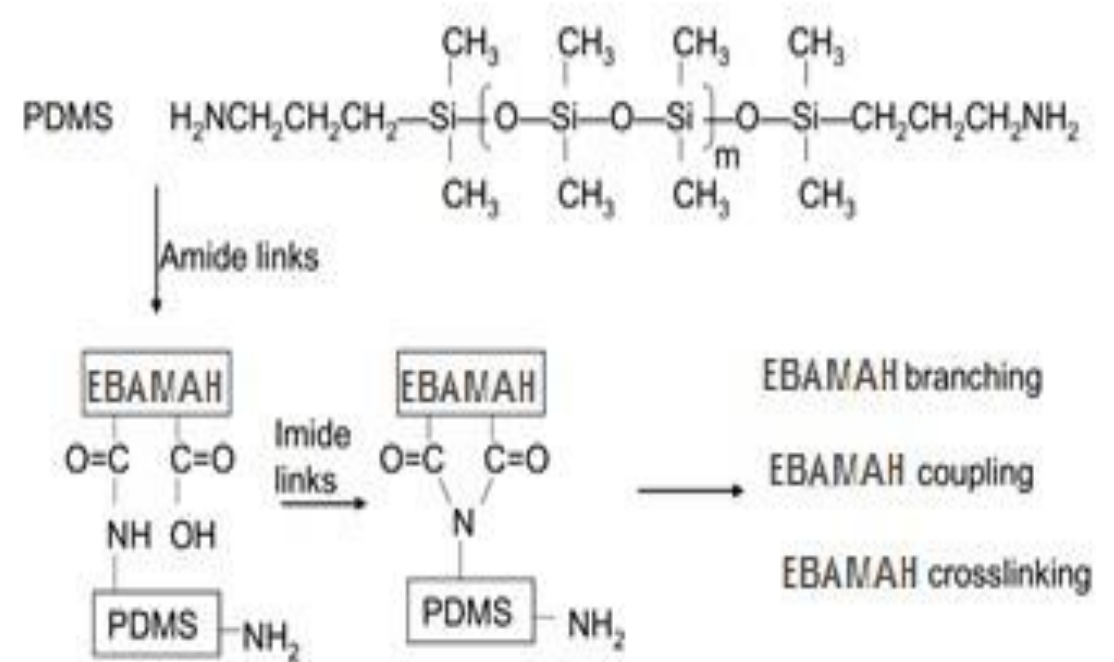
POLYMER ALLOYS - GRAFTALLOY™ PDMS

Polyolefin, modified with polydimethylsiloxane (PDMS) can be used as processing aids as well as a surface modifiers for polyolefins.

PDMS is a naturally low surface energy material, which can be used to decrease friction, wetting of liquids and create a slick surface.

GRAFTING REACTION

PDMS is chemically bonded to polyolefin and will avoid bloom effects, where PDMS migrates to the surface. This phenomena can make the surface tacky and contaminated.



POLYMER ALLOYS - GRAFTALLOY™ PDMS

1. REACTION MECHANISM

PDMS is partially crosslinked to olefin chain, by forming imide groups with maleic anhydride. This prevents PDMS from migrating to the surface and losing its effect.

2. SURFACE PROPERTIES

Static contact angle measurement



EBAMAH: $79 \pm 4^\circ$

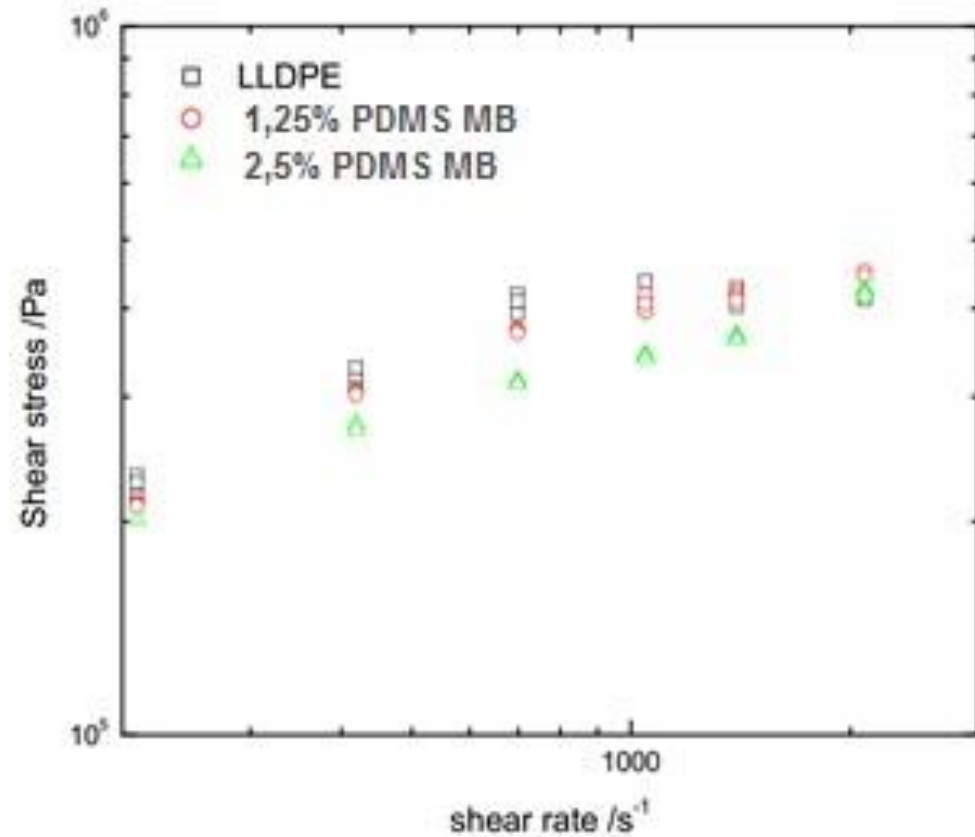
+25% PDMS MB $93 \pm 2^\circ$

+50% PDMS MB: $100 \pm 4^\circ$

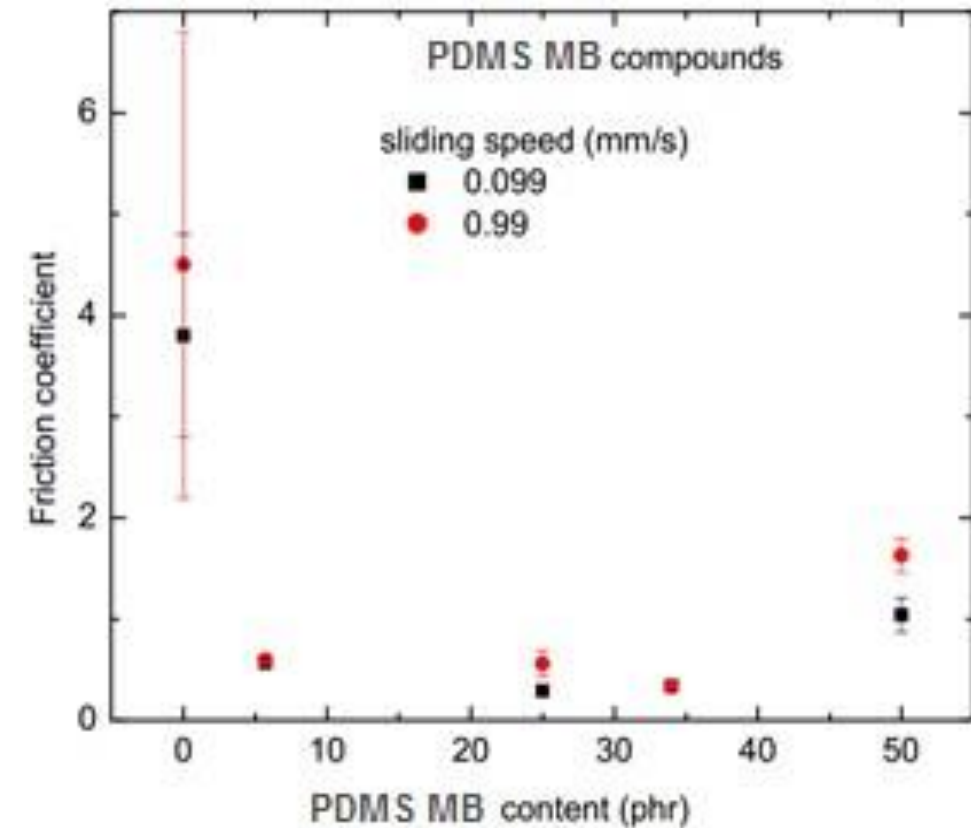
POLYMER ALLOYS - GRAFTALLOY™ PDMS

3. APPLICATIONS

Reduce shear during processing



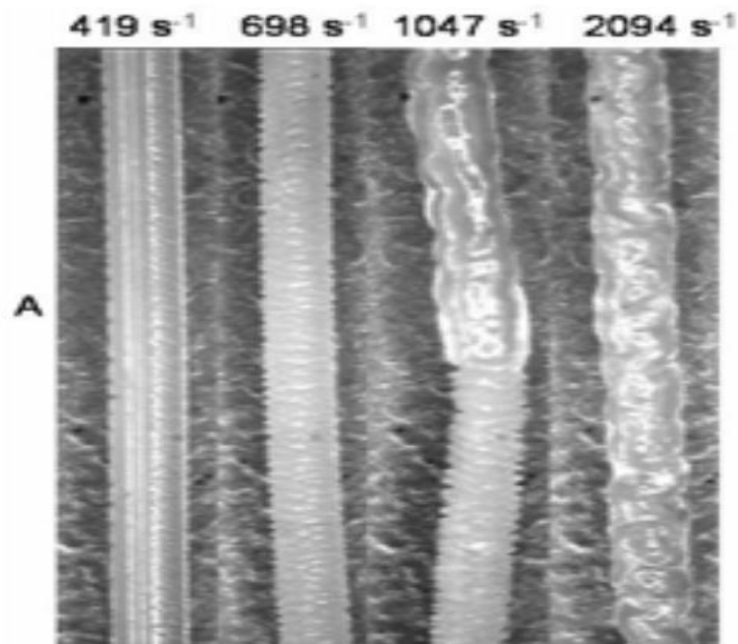
Reduce friction coefficient



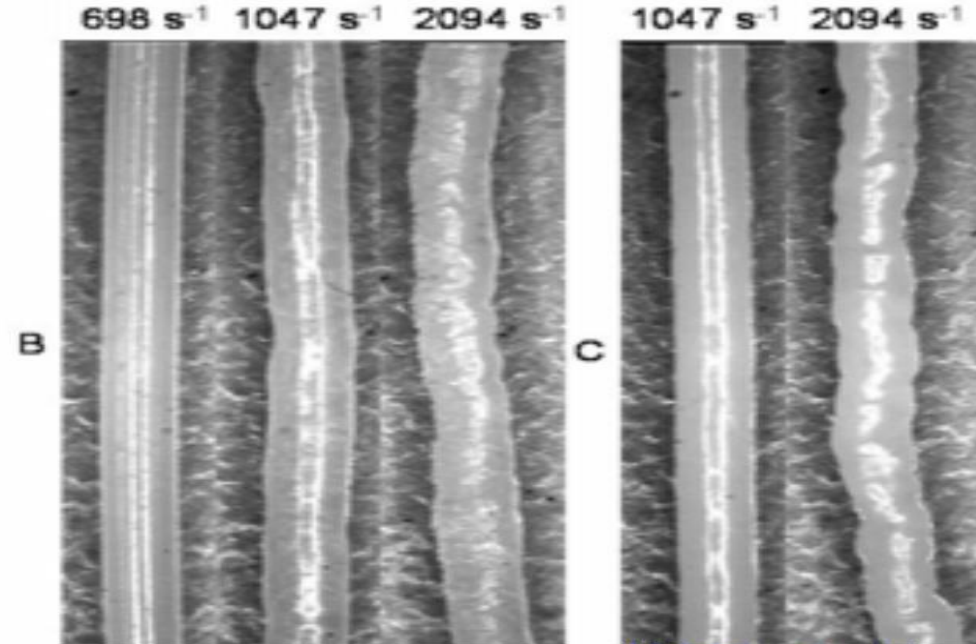
POLYMER ALLOYS - GRAFTALLOY™ PDMS

3. APPLICATIONS

Improve extrudate surface finish



LLDPE



LLDPE + 1,25% PDMS MB

LLDPE + 2,25% PDMS MB

POLYMER ALLOYS - GRAFTALLOY™ PDMS

4. CONCLUDING REMARKS

The PDMS grafted polymer has modified surface properties:

Can be added to almost any type of polymer

Increase slickness of the material

Lower friction coefficient

Lower shear rate during processing and

Improved surface finish of extrudate

WHAT MAKES GP UNIQUE



Use **proprietary co-agents** and **redox initiating system** for grafting



Use of **Nitroxide Mediated Polymerization** for controlled grafting reactions



Co-continuous nano-morphology approach for creation polymeric alloys



Interpenetrating Polymer Networks (IPN)



Thermo-Reversible Crosslinking polymers and **Vitrimers**



Smart Polymers
Self-Healing polymers



In-house synthesis of unique "**nitroxide stable radicals**" (TEMPO) for high-tech composite materials – proprietary process



GRAFT POLYMER
COMBINE INCOMPATIBLE

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