# Creating polypropylene, Shaping a better future

## Automotive and Mobility

PolyMirae supplies the best polypropylene in the world

PolyMirae

# Product Portfolio

## Mobility compound

| Segment | Grade | MFR (dg/min) | FM (Kg/m2) | Impact (@23°C) | Typical applications |
|---|---|---|---|---|---|
| High flow RTPO | ***Hifax*** **EP200R** | 21 | 7,500 | NB | Automotive Bumper/door trim |
| | ***Hifax*** **EP5077** | 40 | 7,500 | NB | Automotive Bumper/door trim |
| | ***Hifax*** **EP140R** | 20 | 6,500 | NB | Automotive Bumper/door trim |
| | ***Hifax*** **BA238A** | 11 | 9,000 | NB | Automotive Bumper/door trim |
| | ***Hifax*** **EP150S** | 30 | 6,500 | NB | Automotive Bumper/door trim |
| Functional PP | ***Hifax*** **EP5175** | 10 | 9,000 | NB | Compound, Automotive, E&E |
| | ***Hifax*** **EP5091** | 30 | 12,000 | 7 | Compound, Automotive, E&E |
| | ***Hifax*** **EP246P** | 20 | 10,000 | 40 | Compound, Automotive, E&E |
| | ***Hifax*** **EP555T** | 60 | 14,000 | 6 | Automotive bumper |
| High Crystallinity HECO | ***Adstif*** **EA5073** | 10 | 15,000 | 8 | Compound/Automotive/E&E |
| | ***Adstif*** **EA5074** | 30 | 16,000 | 6 | Compound/Automotive/E&E |
| | ***Adstif*** **EA5075** | 60 | 16,000 | 5 | Compound/Automotive/E&E |
| | ***Adstif*** **EA5076** | 110 | 17,000 | 3 | Compound/Automotive/E&E |
| Metocene | ***Metocene*** **HM2015** | 140 | 13,500 | 2 | Automotive, Housewares, TWIM |
| | ***Metocene*** **MF650W** | 500 | - | - | Flow modifiers in compounding applications |
| | ***Metocene*** **MF650X** | 1200 | - | - | Flow modifiers in compounding applications |
| | ***Metocene*** **MF650Y** | 1800 | - | - | Flow modifiers in compounding applications |
| | ***Metocene*** **MF650Z** | 2300 | - | - | Flow modifiers in compounding applications |
| | ***Metocene*** **HM840N** | 12 | 21,500 | 3 | Compound, Automotive, E&E |
| High Gloss | ***Moplen*** **EP649N** | 10 | 18,500 | 10 | Compound, E&E |
| | ***Moplen*** **EP310J HP** | 3 | 14,000 | NB | Compound, Injection, Film |
| High flow | ***Moplen*** **EP540V** | 110 | 13,500 | 4 | Compound/TWIM |
| | ***Moplen*** **EP590T** | 60 | 15,000 | 6 | Compound, TWIM |

The above values are our lab data only for customer reference and should not be construed as product specifications. These values may shift as additional data are accumulated.

# Cost saving solution

## Reactor made TPO for super high impact strength

### Benefits

- Excellent impact strength enhancement at both room and low temperature
- Cost reduction by POE reduction
- High flow ability

### Typical applications

- Automotive exterior/Interior parts
  Bumper fascia, IP upper panel,
  side sill molding for SUV car, etc.

| Properties | | Test method (ASTM) | Unit | *Hifax* | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | BA238A | EP140R | EP200R | EP150S | EP5077 |
| MFR | 2.16kg/230℃ | D1238L | g/10min | 11 | 20 | 21 | 30 | 40 |
| Tensile strength | @Yield | D638 | $kg/cm^2$ | 190 | 140 | 180 | 140 | 180 |
| Elongation | @Yield | D638 | % | 7 | 7 | 6 | 7 | 6 |
| Flexural modulus | | D790 | $kg/cm^2$ | 9,000 | 6,500 | 7,500 | 6,500 | 7,500 |
| IZOD strength | @23℃ | D256 | kg.cm/cm | NB | NB | NB | NB | NB |
| | @-20℃ | | | 12 | 20 | 13 | 18 | 12 |

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# Cost saving solution

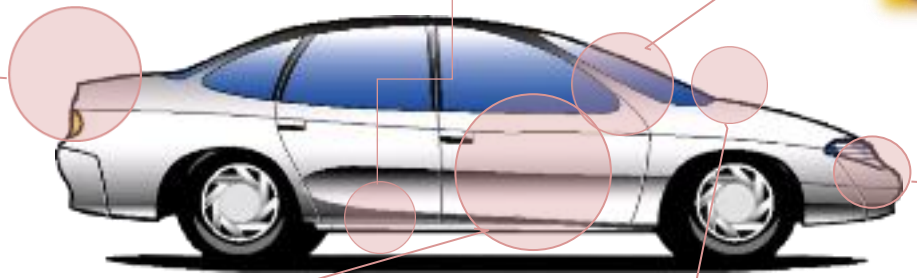
## Case story : RTPO

| | |
|---|---|
| Application | Bumper / Sill side molding<br>Instrument panel / Door trim |
| Existing Material | POE Rubber compounding |
| Driving Force | Cost saving / quality improvement |
| Benefit | Good impact resistance<br>even at low temp |

Rear spoiler

Sill side molding

Instrument panel



Door trim

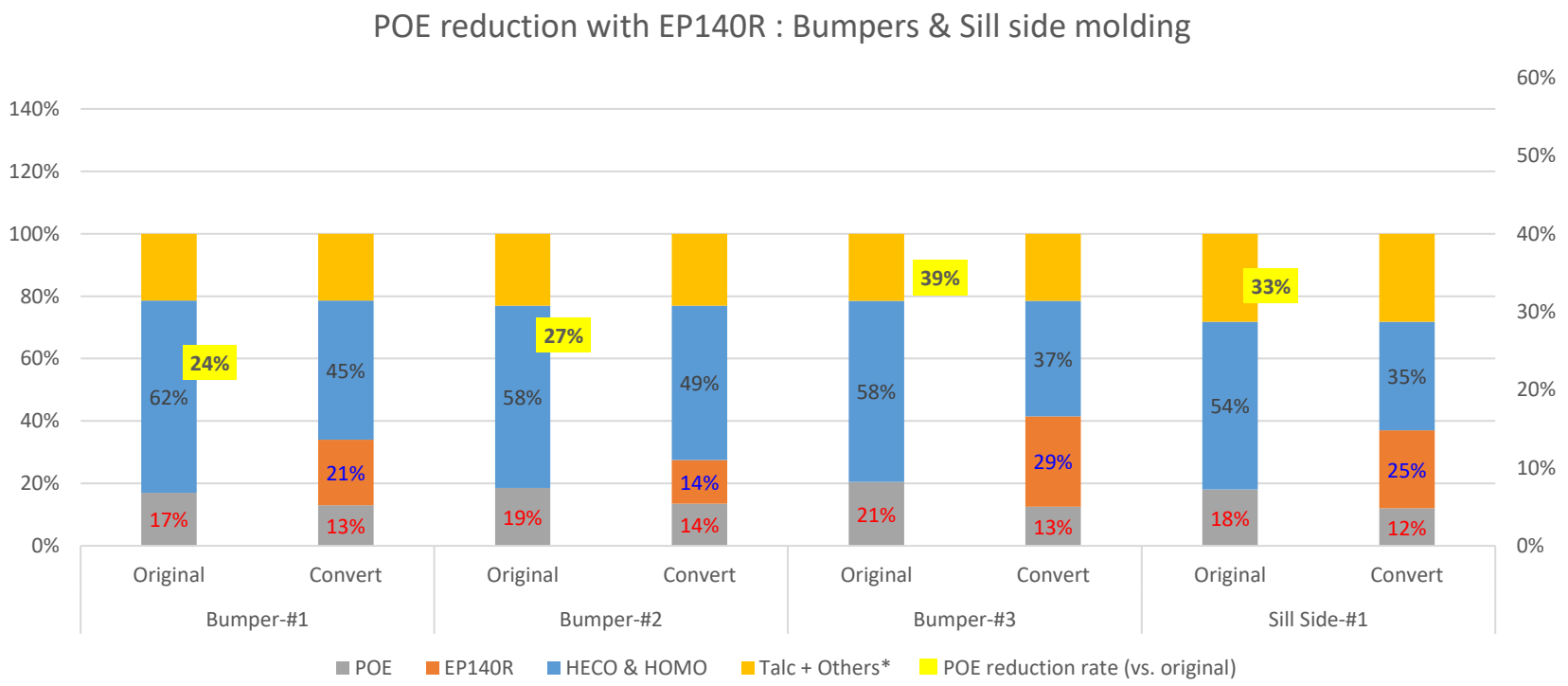
Cowl top cover

Bumper fascia

# Cost saving solution

## Cost saving with *Hifax* EP140R

- **Formulation** : **5 – 10 %** POE reduction by *Hifax* EP140R **(POE reduction rate : > 25%)**
- **Cost Saving**:
  - 5% or more saving compared to original POE recipe
  - New recipe : 10~15 % saving to adjust total formulation according to customer information

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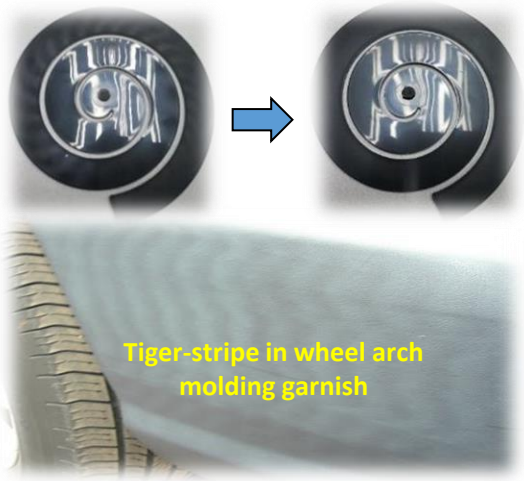
# Anti-tiger strip solution

*Hifax* EP5175 / EP5091 / EP555T

## Benefits

- Solution to tiger stripe problem in large molding Parts of mobility with high flow ability
- Good stiffness and impact balance
- High HDT and low TVOC




## Typical applications

- Automotive exterior/Interior parts
  Bumper fascia, IP upper panel,
  side sill molding for SUV car, etc

| Properties | | Test method (ASTM) | Unit | *Hifax* | | |
|---|---|---|---|---|---|---|
| | | | | EP5175 | EP5091 | EP555T |
| MFR | 2.16kg/230℃ | D1238L | g/10min | 10 | 30 | 60 |
| Tensile strength | @Yield | D638 | $kg/cm^2$ | 220 | 270 | 280 |
| Elongation | @Yield | D638 | % | 10 | 7 | 6 |
| Flexural modulus | | D790 | $kg/cm^2$ | 9,000 | 12,000 | 14,000 |
| IZOD strength | @23℃ | D256 | kg.cm/cm | NB | 7 | 6 |
| | @-20℃ | | | 4 | 2 | 2 |
| HDT | 0.45MPa | D648 | ℃ | 100 | 120 | 125 |

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# Anti-tiger strip solution

## Case story

❖ Unpainted crash pad(IP)

❖ Wooden flour filled door trim garnish

❖ B pillar lower

❖ Unpainted skid plate

❖ Bumper

❖ Unpainted sill side molding

# Low shrinkage solution

*Hifax* EP246P

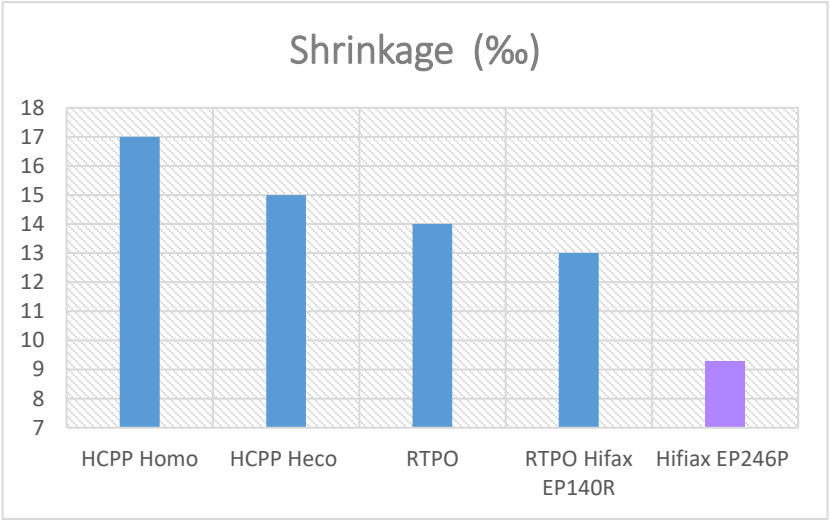
## Benefits

- Solution to low shrinkage (<1%)
- Good stiffness and impact balance
- Good heat resistance

## Typical applications

- Automotive exterior/Interior parts
  : weight reduction / cost saving
- Inter-material replacement
  : ABS, / HIPS etc.

| Properties | | Test method (ASTM) | Unit | *Hifax* EP246P |
|---|---|---|---|---|
| MFR | 2.16kg/230℃ | D1238L | g/10min | 20 |
| Tensile strength | @Yield | D638 | $kg/cm^2$ | 200 |
| Elongation | @Yield | D638 | % | 9 |
| Flexural modulus | | D790 | $kg/cm^2$ | 10,000 |
| IZOD strength | @23℃ | D256 | kg.cm/cm | 40 |
| HDT | 0.45MPa | D648 | ℃ | 100 |
| Shrinkage | | D955 | ‰ | 9 |

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# Light weight solution

## High crystallinity impact copolymers

### Benefits

- High stiffness
- High gloss
- High HDT
- Low TVOC

### Typical applications

- Automotive exterior / interior parts
- Appliance
- TWIM
- Consumers (Plastic chairs)


| Properties | | Test method (ASTM) | Unit | *Adstif* | | | |
|---|---|---|---|---|---|---|---|
| | | | | EA5073 | EA5074 | EA5075 | EA5076 |
| MFR | 2.16kg/230℃ | D1238L | g/10min | 10 | 30 | 60 | 110 |
| Tensile strength | @Yield | D638 | $kg/cm^2$ | 300 | 320 | 300 | 320 |
| Elongation | @Yield | D638 | % | 5 | 5 | 5 | 4 |
| Flexural modulus | | D790 | $kg/cm^2$ | 15,000 | 16,000 | 16,000 | 17,000 |
| IZOD strength | @23℃ | D256 | kg.cm/cm | 8 | 6 | 5 | 3 |
| | @-20℃ | D256 | kg.cm/cm | 3 | 2 | 2 | 2 |
| Features | | | | Low TVOC | | | |

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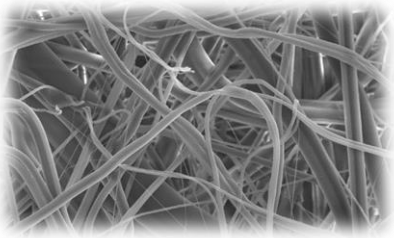
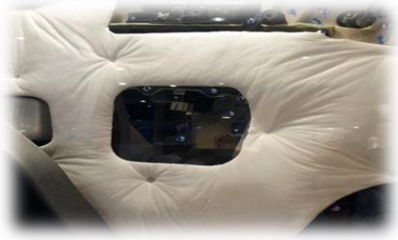
# Low TVOD solution

*Metocene* product for mobility compounding

## Benefits

- Low TVOC, fume, odor
- Very high MFR without need for peroxide
- No alternative with Z-N base PP



## Typical applications

- Flow modifier in compounding application
- Glass fiber compounding
- Sound absorbing material

| Properties | | Test method (ASTM) | Unit | *Metocene* | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | HM2015 | MF650W | MF650X | MF650Y | MF650Z |
| MFR | 2.16kg/230℃ | D1238L | g/10min | 140 | 500 | 1,200 | 1,800 | 2,300 |
| Tensile strength | @Yield | D638 | $kg/cm^2$ | 340 | - | - | - | - |
| Flexural modulus | | D790 | $kg/cm^2$ | 13,500 | - | - | - | - |
| IZOD strength | @23℃ | D256 | kg.cm/cm | 2 | - | - | - | - |
| *C-Emission(VOC) | | VDA277 (VW PV3341) | μgC/g | 1/1/1 | 3/3/3 | - | 3/3/3 | - |

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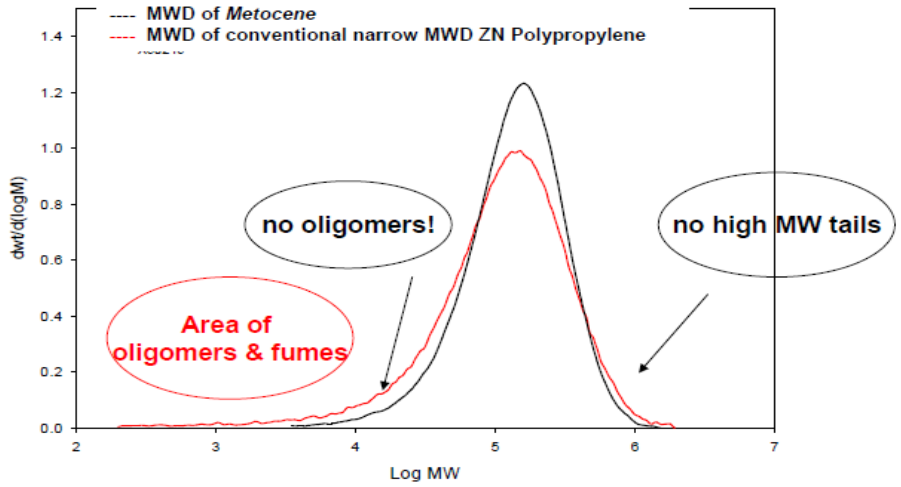
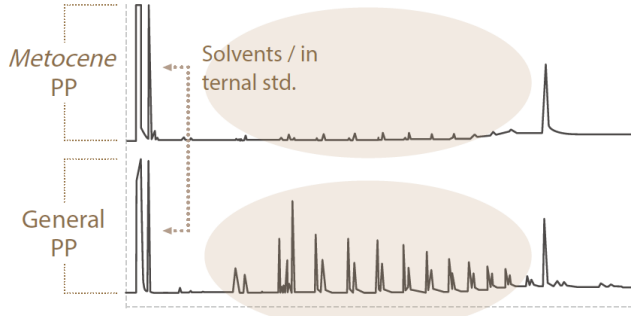
# Low TVOD solution

## *Metocene* PP vs General High MFR PP

- **General High MFR PP vs *Metocene* PP**
  - *Metocene* polypropylene is exceptionally clean due to low extractables, low impurities, low oligomers and low volatiles

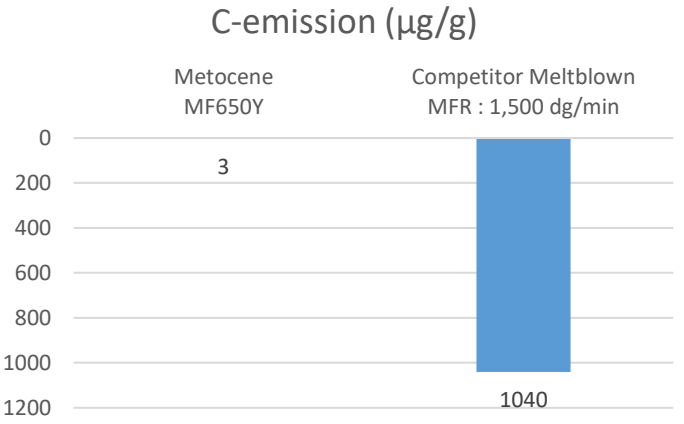



*GC traces illustrating Oligomers*

**The clean characteristic of *Metocene* resin is reflected in the following features :**

- **Reduced presence of low molecular weight material**
- **Absence of un-wanted by-products from peroxide cracking**
- **Absence of neutralizers -not needed due to very low level of catalytic residuals, for example chlorine**




**Test Method : VDA277**

a) The above values are our lab data only for customer reference and should not be construed as product specifications. These values may shift slightly as additional data are accumulated. b) These grades are not suitable for medical applications

# Luxury aesthetics solution

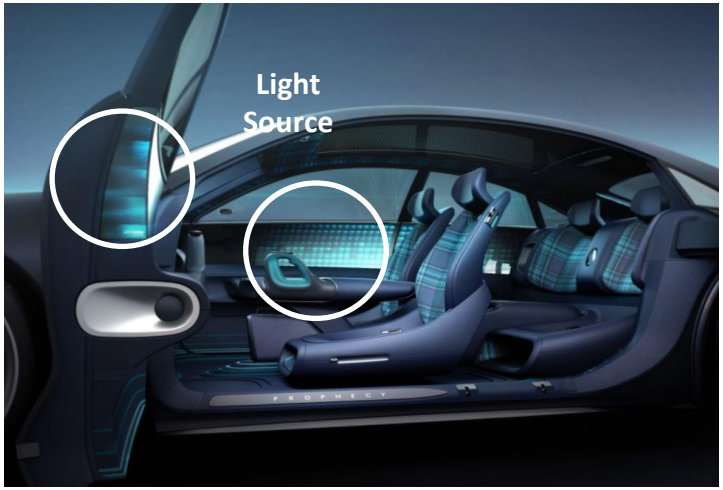
*Metocene* HM840N - High transparent PP

## Benefits

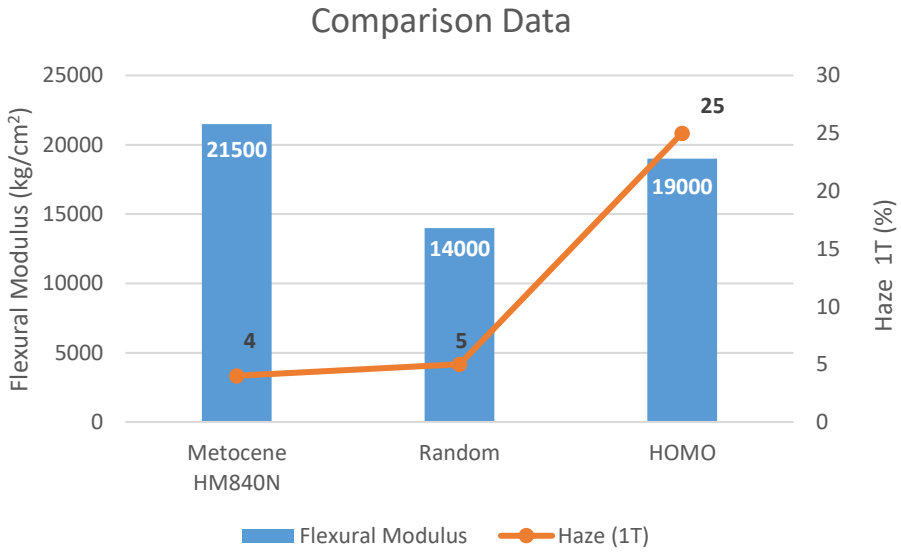
- Good aesthetic
- Low TVOC, fume, odor
- High stiffness and transparent
- High Gloss

## Typical applications

- Automotive interior parts
  - Light or LED beam housing for EV car
  - Door trim
  - Console part




| Properties | | Test method (ASTM) | Unit | *Metocene* HM840N |
|---|---|---|---|---|
| MFR | 2.16kg/230℃ | D1238L | g/10min | 12 |
| Tensile strength | @Yield | D638 | kg/cm$^2$ | 400 |
| Elongation | @Yield | D638 | % | 6 |
| Flexural modulus | | D790 | kg/cm$^2$ | 21,500 |
| IZOD strength | @23℃ | D256 | kg.cm/cm | 2.5 |
| Gloss | | D523 | % | 120 |
| Haze | 1T | D1003 | % | 4 |

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# High flow solution

## Reactor made high flow impact copolymers (Non-visbroken)

### Benefits

- Weight reduction
- Environmental regulation
- High flow ability with non-CR

### Typical applications

- Automotive exterior / interior parts
- Compound / TWIM
- Appliance


| Properties | | Test method (ASTM) | Unit | *Moplen* | | | *Adstif* EA5076 |
|---|---|---|---|---|---|---|---|
| | | | | EP590T | EP547U | EP540V | |
| MFR | 2.16kg/230℃ | D1238L | g/10min | 60 | 70 | 110 | 110 |
| Tensile strength | @Yield | D638 | $kg/cm^2$ | 260 | 245 | 240 | 320 |
| Elongation | @Yield | D638 | % | 4 | 5 | 4 | 4 |
| Flexural modulus | | D790 | $kg/cm^2$ | 15,000 | 13,000 | 13,500 | 17,000 |
| IZOD strength | @23℃ | D256 | kg.cm/cm | 6 | 8 | 4 | 3 |
| | @-20℃ | D256 | kg.cm/cm | 3 | 5 | 3 | 2 |
| Features | | | | FDA, Low TVOC, Odorless | | | Low TVOC Good paintability |

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# Morphology control technology

## High gloss PP *Moplen* EP649N

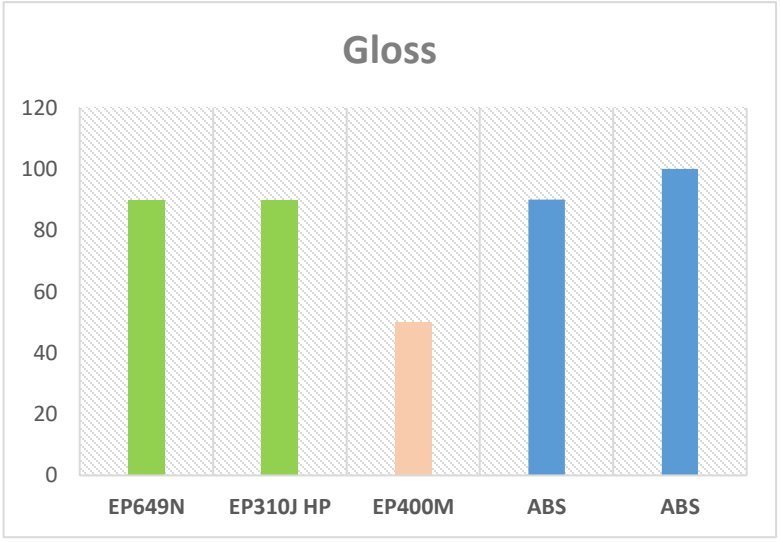
### Benefits

- High gloss, stiffness
- High heat resistance
- UL94 HB & cUL(Canada)

### Typical applications

- Appliance, E&E
- Consumers, Housewares
- Cosmetics

| Properties | | Test method (ASTM) | Unit | *Moplen* | |
|---|---|---|---|---|---|
| | | | | EP649N | EP310J HP |
| MFR | 2.16kg/230℃ | D1238L | g/10min | 10 | 3 |
| Tensile strength | @Yield | D638 | $kg/cm^2$ | 320 | 300 |
| Elongation | @Yield | D638 | % | 7 | 11 |
| Flexural modulus | | D790 | $kg/cm^2$ | 18,500 | 14,000 |
| IZOD strength | @23℃ | D256 | kg.cm/cm | 10 | NB |
| HDT | | D648 | ℃ | 130 | 105 |
| Gloss | | D523 | % | 90 | 90 |

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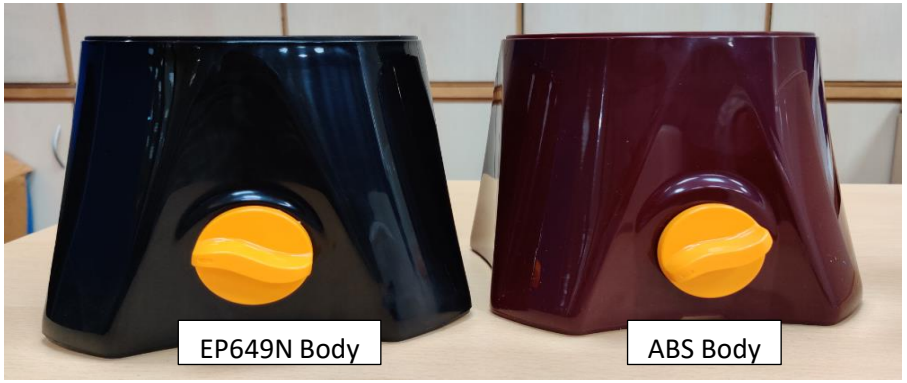
# Morphology control technology

## Case story

- **Project**
  - ABS replacement for cost-saving
- **Application**
  - Mixer/Grinder Body
- **Key Requirement**
  - Balance of stiffness and Impact resistance
  - Aesthetics (Glossy surface)
- **Formulation**
  - EP649N + 10% Talc + 3% color MB
- **Benefit of EP649N**
  - High heat resistance
  - High stiffness with balanced impact resistance
  - High gloss



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Creating polypropylene, shaping a better future

# Thank you for your attention

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