

# PLUSS®



Pluss Polymers is an offshoot of Manas, established to develop and market new technologies and products developed inhouse. Pluss Polymers was incorporated in 1993 to commercialise the technology for grafted modified polymers and alloys and blends. Backed by competent technical staff, laboratory facilities, a good library and technical database with a retrievable wealth of information marketed the OPTIM® brand of grafted polymers for the first time in India in 1996.

OPTIM® coupling agents and compatibilisers allow plastics manufacturers of world class quality products to *OPTIMise* their compound properties. The ADNYL® range of nylon alloys provide the user with extra tough nylon for increased strength.

Profiles and other rigid and flexible containers for thermal energy storage have also been introduced in India for the first time by Pluss Polymers.

**OPTIM®**  
**Chemically Modified Polyolefines**

**TECHNICAL DATA SHEET**

Product : OPTIM® GE-340, OPTIM® GE-344  
 Series : 300  
 Description: OPTIM® GE 340 is Glycidyl Methacrylate grafted LLDPE  
 : OPTIM® GE 344 is Glycidyl Methacrylate grafted ULDPE  
 Appearance: Off white to light yellow free flowing granules / pellets.

Properties	GE-340	GE344
Density g/ml	0.936	0.87
MFI g/10min. (190°C, 2.16 Kg)	4.0	5.5
Grafted GMA %	1.5	2

**Applications**

Impact modifier for Polyethylene terephthalate, Polybutylene terephthalate and Polycarbonate.

The low crystallization rate and the slow nucleus formation are advantageous for the manufacture of highly transparent PET bottles. But they constitute a serious handicap in injection molding of PET. Injection into heated molds (about 150°C) to accelerate crystallization and to shorten cycle times yields finished articles of low crystallinity that are difficult if not impossible to remove from the mold. If very long and uneconomical cycle times are used, the resultant products are too brittle with very low impact strength that can be deformed in the service conditions. Thus to process/recycle PET for injection moulding it becomes imperative to increase impact strength and rate of crystallisation.

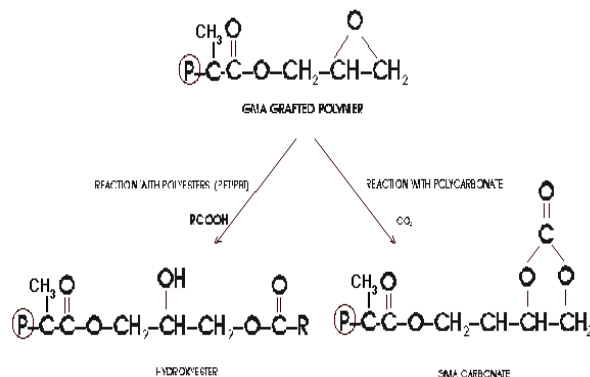
PBT on the other hand has excellent injection moulding characteristics as compared to PET. It is thus the material of choice for a number of applications. PBT is used in the electronics, computer and automobile industries for making high-performance parts by injection molding. However, for some high performance applications it is desirable to have higher impact strength than what is available.

Pluss Polymers have developed GE 340 & GE 344 that can increase the impact strength of Polyesters & Polycarbonates. These are Glycidyl Methacrylate (GMA)

grafted Polyethylenes. Acrylic and epoxy functionality means that GMA monomer can react with an extremely wide range of monomers and functionalized molecules, providing greater flexibility and freedom in polymer design.

The epoxide group during compounding reacts with –OH and carboxylic end-groups of the polyesters producing an alloy of LLDPE and polyester (e.g. PET/PBT or PC). The presence of LLDPE (in GE 340) gives a rubber toughening effect, leading to an increase in impact strength. Since ULDPE is more rubbery (has a lower T<sub>g</sub>) than LLDPE, it gives a better toughening effect. The same can also be used to enhance the impact strength of Poly Carbonates. These are specially useful when recycling the above polymers.

The various reactions that take place are as follows:



Where P is the Polymer chain, (LLDPE in GE 340 & ULDPE in GE 344)

A usage level of 2-10% by weight of the total polymer is suggested depending upon the level of toughness required.

**Pluss Polymers Pvt. Ltd.**

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